Illuminating Engineer

XVIII. June, 1935 Price 9

The problem of highway lighting continues to exercise many minds. We respectfully submit this solution to the consideration of those readers of this Journal to whom the subject may be of interest.

A NEW THOUGHT—ON STREET LIGHTING

This illustration has been prepared to give an indication of one manner in which the problem might be solved.

It will be noticed that the buildings on each side are bathed in light, each building, whatever its formation, receiving equal illumination.

This system, therefore, is adaptable to the dual purpose of flood-lighting each side of the road, as well as the road itself.

The problem, as we see it, is to provide a uniform distribution of light over the length and breadth of the road, avoiding glare in the eyes of road users and obstruction of vision. If this can be achieved without excessive current consumption a solution will be within sight.

New principles of light diffusion and deflection which have already been widely adopted in other fields of illumination, make an installation on the lines illustrated a practical proposition.

The units incorporate a single lamp, the light being completely diffused and distributed without loss over a wide area. The light is accurately controlled, and a succession of units at suitable intervals would provide a uniform flux of light, smoothing out the alternate pools of light and shadow which characterise most existing systems of street lighting.

The units can be suspended from over-head cables or supported on pillars, and can be made instantly accessible.

From an æsthetic, as well as a utility standpoint, such an installation would have much to commend it.

Full details for a scheme of lighting on these lines have been prepared and we shall be pleased to discuss them with anyone interested in the subject of street lighting. Enquiries are invited.

Official Journal of THE ILLUMINATING ENGINEERING SOCIETY
FOUNDED IN LONDON 1909
INCORPORATED 1930

The ILLUMINATING ENGINEER

THE JOURNAL OF GOOD LIGHTING

Edited by

J. STEWART DOW

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EDITORIAL AND PUBLISHING OFFICES
32 VICTORIA STREET, LONDON, S.W.1
Tel. No: Victoria 5215

Principal Contents:

Twenty-Five Years of Public Service, 1910-1935

IN this issue we furnish an illustrated description of the floodlighting display arranged in celebration of King George's Silver Jubilee—undoubtedly the most impressive ever staged in this country.

The display attracted immense crowds to London and afforded them a unique opportunity of expressing their loyalty and esteem for the Royal Family. It was floodlighting that brought the people into the parks by night. But it was their desire to see and cheer the King that kept them waiting in their thousands before Buckingham Palace evening after evening.

Many tributes have been paid to the Twenty-Five Years of Public Service thus happily consummated. Much has been written on the sterling qualities that have gained for King George the confidence and affection of his people; on his kindness and sagacity, and, above all, the steadfast and unassuming courage which has enabled him to "get on with his job"—a homely phrase crystallising the national philosophy and sense of duty—during a period of strain and difficulty such as few monarchs can have endured.

Such service and such deserved devotion do indeed "shine like a candle" in the troubled and darkened world of to-day.

International Commission on Illumination

Forthcoming Session in Germany

The ninth session of the I.I.C. is to take place in Germany next month. The session will be divided into two portions to take place in Berlin (July 2-5) and in Karlsruhe (July 8-10). The programme is a very comprehensive one, as will be seen from the following list of subjects on which reports are expected:—Vocabulary; Definitions; Glare; Photometry of Discharge Tubes; Photometric Accuracy; Photometric Test Plates; Physical Photometry; Colorimetry; Diffusing Materials; Light Distributions; Street Lighting; Automobile Headlights; Factory and School Lighting; Aviation Lighting; Aircraft Lighting; Traffic Signals; Coloured Glass for Signals; Artificial Daylight; Shadows; Mine Lighting; Ultra-violet Light; Lighting Education; Lighting Practice. From the printed prospectus now available it is evident that visitors will be most agreeably entertained, and we hope that this country will be fully represented at this important Conference. Further particulars may be obtained from the General Secretary (Mr. J. S. S. Preston, National Physical Laboratory, Teddington).

The Needs of Country Members

During the last few years the number of members of the Illuminating Engineering Society who are resident abroad, or at least some distance from London, has increased considerably. Such members can only attend meetings of the Society very occasionally. The journal helps them to keep in touch with what is going on, but it is naturally not so easy for them as for London members to get quick information of the latest developments in lighting equipment. A correspondent, in pointing out this drawback, asks us to suggest to firms who are associated with the Society that they should make a practice of sending on new literature on lighting to country members as soon at it is issued. We are quite sure that it is only necessary to mention this need and that firms will be quick to respond. The names and addresses of all country members up to October, 1934, will be found in the annual printed list, and of others who have since joined in back numbers of this journal, in which they are regularly published during the session.

Association of Public Lighting Engineers

Forthcoming Annual Conference

We gather that applications to take part in the above Conference, which is being held in London during September 9 to 12, are steadily rolling in. There is every reason to expect that the attendance will once more be a record. Reminders have recently been circulated to members of the A.P.L.E. and we take this opportunity to recall to members of the Illuminating Engineering Society the special arrangement made for this coming Conference, whereby they are invited to take part on payment of a nominal registration fee of 10s. 6d. Forms of application, which should be lodged with the honorary secretary at 32, Victoria-street, London, very shortly, are still available. (No fee is required from members of the Illuminating Engineering Society who are also members or associates of the Association of Public Lighting Engineers.) An interesting series of papers has been arranged and the programme promises to be of a particularly interesting nature. We strongly advise all those who can possibly do so to make a point of attending this Conference.

The National Electrical Convention

The above Convention has been described as truly national in scope and offering opportunities to every section of the electrical industry, amongst which lighting is surely one of the most important. If, however, it is intended that anyone interested in the aims of the Convention is free to attend, this has not been made very clear. There do seem to have been some lapses in the organisation and publicity of the Conference. We understand that the Illuminating Engineering Society has not been officially invited to appoint delegates. We have received from some of its members, who are identified with electric lighting, complaints that they, too, have had no information about the Convention, and are uncertain whether they are free to participate. One can understand some imperfections on the occasion of this, the first "national" conference. But the position should be made clear and all cause for complaint removed before next year.

TECHNICAL SECTION

COMPRISING

Transactions of The Illuminating Engineering Society and Special Articles

The Illuminating Engineering Society is not, as a body, responsible for the opinions expressed by individual authors or speakers.

The Illuminating Engineering Society

Annual General Meeting

(Held at the Institution of Mechanical Engineers, Storey's Gate, St. James's Park, London, S.W.1, at 6.30 p.m., on Tuesday, May 14th, 1935.)

THE Annual General Meeting of the Illuminating Engineering Society was held in the Lecture Theatre of the Institution of Mechanical Engineers, on Tuesday, May 14, 1935. Members assembled for light refreshments at 6.30 p.m., and the chair was taken by THE PRESIDENT (Mr. H. Hepworth Thompson) at 7 p.m.

After the minutes of the last Annual General Meeting had been taken as read, the HON. SECRETARY read out the notice convening the meeting. In subsequently presenting the Annual Report of the Council (see pages 176-180) he explained that the report had been circulated to all members of the Society. It was, therefore, unnecessary to summarise its contents, which, however, revealed that satisfactory progress had been made during the past year.

The President then called upon Mr. PERCY GOOD (Hon. Treasurer) to present the statement of accounts for the past year. Mr. Good having read the statement of the auditors appearing at the foot of the balance-sheet, said he thought that everyone would agree with him that the accounts showed a steady progress.

Review of Past Session

THE PRESIDENT then said that before proceeding to the next item he would like to review briefly the work of the closing session. This certainly revealed progress. Yet, having said in his presidential address that he was not satisfied with the progress of the Society, he must confess that he was still not satisfied. He wanted much, and had as yet attained less than he desired. This should not be taken to mean that they had failed to make progress, for over 100 new members had been added during the past year, and the financial position had again improved. In addition, the papers had been better, the audiences greater, more publicity has been obtained for the Society's work, whilst at the annual dinner a new record was reached.

In regard to the increased membership, he would like to thank those who had responded to his numerous appeals, but the greater part of his dissatisfaction was due to the fact that the response had not been much greater. He again appealed to everyone to do their best to interest others, for a greatly increased membership was essential for the realisation of the aims visualised in his address.

In conclusion, the President remarked that at the end of the annual report a brief reference had been made to the suggestions contained in his inaugural address, which had been and were being studied at length by a special committee. It was anticipated that concrete proposals will be brought before members of the Society at a special meeting to be held on September 26, shortly before the opening of the next session. The carrying out of these proposals, which should increase the prestige and usefulness of the Society, would involve a considerable amount of work and extra expenditure. A growing income was therefore needed to meet this increased demand, whilst some of the Society's ideals—such as the ideal of having a home of their own—could only thus be attained when the present membership has been substantially increased.

He concluded by expressing his pleasure in the presence of Dr. Pirani and a number of visitors here who were looking forward to his address, and whom he took the opportunity of welcoming.

Adoption of Report and Accounts

The following resolution was then moved by Mr. L. E. BUCKELL:—"That the Report of the Council for the session 1934-1935 and the accounts of the Illuminating Engineering Society for the period from January 1, 1934, to December 31, 1934, be hereby adopted, and that a vote of thanks be extended to the President, Council, and Officers for their efforts on behalf of the Society during the past session."

In moving the resolution Mr. Buckell said it gave him pleasure to be in a position to move the adoption of this excellent report and statement of accounts for 1934. He would like to have commented upon the report, but as they were all anxious to hear Dr. Pirani's address, he would confine himself to a few

remarks. He could not let the occasion pass without mentioning the increased membership gained largely through the President's efforts, and the record attendance at the annual dinner. This served to confirm the view that the Society was now taking its proper place in the scientific world. He was very glad to see that the Council had decided to consider the excellent suggestions contained in the presidential address. He was sure that all members were anxious to help the Society, but they looked to the Council for guidance. He would like to congratulate the President, Council, and Officers for the continued progress of the Society, which they had helped so much to obtain.

Mr. C. I. WINSTONE said that in seconding this resolution he, too, wished to congratulate the Council and Officers on what had evidently been a year of records. Such records were only obtained by hard work, and he felt sure that all members were grateful for their efforts that had secured them.

Mr. Justus Eck then proposed the following resolution, which was seconded by Mr. Harold Bright, and was also carried unanimously:—

"That this meeting records its appreciation of the services of Messrs. Robert J. Ward and Company as auditors of the Society, and approves of their re-election for the next session."

Ordinary General Meeting

The formal business of the annual general meeting having been completed, the ordinary general meeting was commenced. The minutes of the last meeting having been taken as read, the Hon. Secretary read out the names of applicants for membership, which are appended. The names of those presented at the last meeting on April 9* were read again, and these gentlemen were formally declared members of the Society.

Applicants for Membership

CORPORATE MEMBER:—

Bicknell, C. R. .....1, Oakway, Shortlands, Kent.

COUNTRY MEMBER:—

Lord, Leighton.....Philips Lamps, Ltd., Australia

Professor Pirani's Address

THE PRESIDENT then called upon PROFESSOR Dr. M. PIRANI to deliver his address on "The Production of Light," which was illustrated by numerous lantern slides and experiments. The lecturer explained the physical basis of light-emission, and the contrast in the effect produced by incandescence, yielding continuous spectra, or various forms of luminescence. This led to an account of the latest forms of electric discharge lamps and to an analysis of the possibilities of fluorescent and phosphorescent substances which convert ultra-violet radiation into light. The properties of such materials were illustrated by a number of striking demonstrations, of special interest being their use to extend the range of coloured light available from tubular sources.

A cordial vote of thanks to Professor Pirani for his address, proposed by the President and carried with acclamation, terminated the proceedings.

(Professor Pirani's Address, with illustrations, will appear in a subsequent issue. Ed.)

* "Illum. Eng.," May, 1935, p. 145.

Report of the Council for the Session, October, 1934, to May, 1935

(Presented at the Annual General Meeting of the Illuminating Engineering Society, held by permission of the Council of the Institution of Mechanical Engineers, in the Hall of the Institution (Storey's Gate, St. James's Park, London, S.W.1) at 6.30 p.m., on Tuesday, May 14th, 1935).

DURING the past session the Society has entered upon its second 25 years of existence. The Council is gratified to be able to report that progress in its work and improvement in its position have again been made.

Election of Officers and Council for Next Session

In accordance with the procedure outlined in the Articles and By-Laws of the Society, the nominations made by the Council to fill vacancies have been published in THE ILLUMINATING ENGINEER (March, 1935, page 68) and circulated to all members, who were thus offered an opportunity of making additional nominations, if they so desired. No new nominations having been received, those nominated by the Council are now automatically elected.

Accordingly, Mr. A. W. Beuttell will become President for the next Session; Dr. S. English will become Vice-President; Mr. J. S. Dow will continue as Hon. Secretary, and Mr. Percy Good will continue as Hon. Treasurer.

The following members will fill vacancies on the Council: Mr. D. Chandler, Dr. W. M. Hampton, Mr. H. Lingard, Mr. F. W. Purse, Mr. W. R. Rawlings, and Mr. F. C. Smith.

Work of Committees

The four main Standing Committees of the Society were constituted as follows:—

General Purposes Committee: Mr. H. Hepworth Thompson (President, Chairman), Mr. J. S. Dow (Hon. Secretary), Mr. Percy Good (Hon. Treasurer), Mr. C. W. Sully, Mr. A. W. Beuttell, and Mr. W. J. Jones.

Papers Committee: Mr. A. Cunnington (Chairman), Mr. J. G. Clark, Mr. J. S. Dow, Mr. R. S. Downe, Mr. W. J. Jones, Mr. Waldo Maitland, Dr. J. W. T. Walsh, and Mr. G. H. Wilson.

Technical Committee: Mr. W. J. Jones (Chairman), Mr. A. W. Beuttell, Mr. H. Buckley, Mr. J. G. Clark, Mr. J. S. Dow, Mr. George Herbert, Mr. Waldo Maitland, Mr. C. A. Masterman, Mr. T. E. Ritchie, Mr. E. Stroud, and Mr. G. H. Wilson. Co-opted: Mr. Harold Bright, Dr. S. English, Mr. H. Lingard, and Mr. F. C. Smith.

Membership and Development Committee: Mr. A. W. Beuttell (Chairman), Mr. J. S. Dow, Miss C. Haslett, Mr. Cecil Hughes, Mr. W. J. Jones, Mr.

Stephen Lacey, Mr. James Sellars, Mr. E. Stroud, Mr. C. W. Sully, and Mr. H. Hepworth Thompson. Co-opted: Mr. G. Franklin, Major H. C. Gunton, Mr. E. J. Stewart, and Mr. W. A. Wales.

In addition to the above a *Special Ad Hoc Committee* consisting of Mr. H. Hepworth Thompson (President), Mr. A. W. Beuttell (Vice-President), Mr. J. S. Dow (Hon. Secretary), Mr. Percy Good (Hon. Treasurer), Mr. C. C. Paterson (Past President), and Dr. J. W. T. Walsh (Past President), was appointed to review the various suggestions contained in the Presidential Address. The Committee has already presented to the Council an Interim Report on certain of these suggestions; others will naturally require longer consideration before definite recommendations can be made. Some indication of the views of the Committee is, however, given in the final section of this report.

The various Panels formed by the Technical Committee and specified in the last report have been pursuing their studies, and in some cases have completed the tasks assigned to them. The main problem before the Committee, that of preparing a statement of Values of Illumination for use in various classes of buildings, has been resumed. The fundamental problems underlying the problem, such as were reviewed in the paper read before the Society in the previous Session by Mr. A. W. Beuttell, are now being investigated by a Sub-Committee working under the Department of Scientific and Industrial Research. This inquiry will inevitably require considerable time, and the series of values now being determined will be based on an intelligent survey of what constitutes good practice at the present time.

A review of literature bearing on the Use of Scale Models in Illuminating Engineering has been presented at a Meeting of the Society by Mr. H. S. Barlow, one of the members of the Panel appointed to study this question. It is hoped that some statement of another problem, "A Method of Calculation of Artificial Illumination from Line and Surface Light Sources," will be available very shortly. The problem of determining "A Method of Predetermining the Efficiency and Surface Brightness of Lighting Equipment" was found to demand continuous study by a whole-time investigator. By a fortunate arrangement it has been found possible to arrange for this work to be undertaken by a research student at the University of Birmingham, the results of whose labours will be communicated to the Society in due course.

Other problems which are receiving the attention of the Technical Committee are: The Preparation of Data Illustrating the Appearance of Colour by Artificial Light in the Dictionary of Colours"; the Classification of Literature on Illumination in Libraries and Facilities for the study thereof; and the determination and specification of degrees of gloss or polish in various industries. The Technical Committee has thus already been responsible for the initiation of a number of investigations, some of which have already yielded useful material for papers before the Society.

The Leon Gaster Memorial Fund

A statement of the income and expenditure of this fund, which is now in its fourth year of operation, is appended. The fourth award of the Leon Gaster Premium of ten guineas was made during the past Session to Mr. A. W. Beuttell, for his excellent paper entitled "An Analytical Basis for a Lighting Code," read at the meeting of the Society on December 12, 1933.

The Silver Jubilee Commemoration (1934) Award

In order to mark the Silver Jubilee of the Society the Council has initiated a special award, open to members of all classes and affiliated students under the age of twenty-six years, consisting of an inscribed Diploma and a Cheque for Five Guineas. The qualification for this award, which will be made for the first time in respect of the session 1934-35, is the accomplishment of any of the following tasks:—

I. The presentation in writing to any Technical Society or Association, approved by the President, of a paper dealing with the theory or practice of Illuminating Engineering.

II. The design and/or construction of a novel instrument or appliance for use in connection with an application of or research concerning illumination.

III. The carrying out by the applicant of an investigation beneficial to Illuminating Engineering.

Meetings of the Society

At the Opening Meeting of the Society on October 9, 1934, the Presidential Address was delivered by Mr. H. Hepworth Thompson, who made a series of important suggestions affecting the future of the Society. The usual report on progress prepared by the Technical Committee was also presented. The display of apparatus at the opening meeting was even more comprehensive than in previous years, and a new precedent was set by arranging for similar exhibits in two Provincial Cities, namely, Birmingham and Liverpool.

At the subsequent meeting on November 13, Mr. R. W. Daniel (H.M. Inspector of Factories, Sheffield) read a paper entitled "Industrial Lighting: Some Problems in Sheffield and their Solution," which contained an informative survey of the methods adopted in different trades, and illustrated the vital need for improvement in the lighting conditions in certain factories. On December 3 Mr. C. W. Sully delivered an address entitled "The Outstanding Characteristics of Illumination by Electricity" to a Meeting with the Electrical Association for Women, to which members of the Society were invited. This address was of a popular character, and was illustrated by numerous attractive experiments.

The paper on "Floodlighting with Gas," delivered by Mr. H. E. Bloor (York Gas Company) on December 11, gave an exposition of the aims of Floodlighting from the Aesthetic Standpoint, while Mr. L. G. Applebee's contribution entitled "A Cavalcade of Stage Lighting," read on January 8, embodied a review of the methods of stage lighting from early days up to the present time.

On February 19 a paper on "The Time Characteristics of Tungsten Filament Lamps for Flashing Signals, Signs and Beacons" was presented by Mr. J. M. Waldram and Mr. J. M. Sandford, and on March 12, at a Joint Meeting with the Royal Aeronautical Society, Mr. H. N. Green dealt with "Recent Developments in the Lighting of Airways and Aerodromes."

The subsequent meeting on April 9 was devoted to a series of short contributions, namely: A Works' Photo-electric Method for the Photometry of Electric Discharge Lamps (Mr. P. D. Oakley); A Simple System for Recording and Displaying Measurements of Illumination (Mr. R. R. Homes); The Use of Scale Models in Illuminating Engineering (Mr. H. S. Barlow); and Practical Considerations in Architectural Lighting (Mr. H. Lingard).

At the Annual General Meeting on May 14 the practice adopted in recent years of inviting an expert from abroad to deliver an address is again to be followed. On this occasion Professor Dr. M. Pirani (Berlin) will deliver the address, which will deal mainly with certain investigations bearing on the production of light.

In the course of the Session a postcard vote was taken amongst members in regard to the times and dates of meetings. The present arrangements are the result of careful consideration of this question during past sessions. It, is interesting to observe, therefore, that the vote approved the present arrangements as serving the convenience of the majority of members. In regard to the choice of day the vote was very strongly in favour of Tuesday. In regard

to the best time for meetings, opinion was divided between 6 to 8 p.m. and 7 to 9 p.m. as the best time, but on the whole the existing time (7 to 9 p.m.) was favoured; only a very few votes were cast for the later period (8 to 10 p.m.).

Meetings in Provincial Cities

As mentioned above, the display at the opening meeting in London was followed by similar exhibits in Birmingham (October 11) and Liverpool (October 16). The latter meeting was held under the auspices of the North Western Local Centre of the Society, which has arranged its own programme and has held meetings at intervals throughout the Session. At a meeting in Manchester on November 28 a paper on similar lines to that delivered in London was read by Mr. R. W. Daniel. Other meetings in Manchester were devoted to a paper on "Road Surface Reflection Characteristics and Their Influence in Street Lighting," by Mr. J. M. Waldram, on January 16, and a discussion opened by Mr. C. A. Masterman on "The Problems of Street Lighting," on April 10.

Visits

On January 15 Members of the Society visited the new home of the Royal Institute of British Architects, the structural design and lighting of which presented many original features. A second visit was arranged on April 16, on the invitation of Mr. J. C. Christie, to the Glyndebourne Festival Opera House, Lewes, Sussex.

Membership

The new arrangement, adopted for the first time in the previous Session, in regard to Affiliated Students, has led to a number of additions to the membership of the Society, thirty-one students having joined on this basis. Several members have given addresses at Technical Colleges with a view to interesting students in Illumination, amongst which may be mentioned those delivered by Mr. S. B. Langlands at the Heriot-Watt College (Edinburgh) and by Mr. A. W. Beuttell at Faraday House (London).

During the past year a substantial increase in the membership of the Society has taken place, over 100 applications for membership of all classes (including Affiliated Students) having been received since the opening of the Session. This encouraging result is largely due to the personal efforts of the President, who, besides approaching numerous outside organisations, addressed a special appeal to all members of the Society. The Council, however, desire to impress on members that the main need of the Society at the present moment is *a considerable increase in membership*. On this depends the realisation of many of the aims outlined in the Presidential Address and mentioned in the final section of this report.

Annual Dinner

At the Annual Dinner, which was again held at the Trocadero Restaurant (Piccadilly Circus) on February 5, the experience of recent years was repeated, the attendance (272, according to the Table Plan) being once more a record. The toast of "The Illuminating Engineering Society" was proposed by the Rt. Hon. W. Ormsby Gore, M.P., who gave an account of the varied aspects of Illumination in which his department was interested, and dwelt particularly on the arrangements to be made for the special illumination of London on the occasion of the Silver Jubilee Celebrations on May 6. The toast of "The Guests" was proposed by Mr. C. C. Paterson, O.B.E. (Past President), and was responded to by Mr. C. Valon Bennett (President of the Institution of Gas Engineers) and Professor W. M. Thornton (President of the Institution of Electrical Engineers). As usual, kindred Societies and Institutions were well represented amongst the guests.

Financial Position

The accounts for the past year, which are attached to this report, resemble those of previous years in affording evidence of steady progress. The income from subscriptions has again increased substantially, but the expenses have also risen—a natural increase in view of the continually extending work of the Society and its increased expenditure on provincial meetings. In the course of the Session the Council approved an increase of £100 per annum to the amount annually allotted to the Hon. Secretary for Rent and Clerical Expenses, a step which they considered fully justified in view of the great improvement in the finances of the Society that has taken place during the last seven years.

During the past year the Society's holding in 3½ per cent. registered War Stock was increased to £1,200, and since December 31, 1934 (the terminating date of these accounts), the amount invested in 3½ per cent. registered War Stock has again been increased by £300, so that the total amount thus held now stands at £1,500.

Statements relating to the Leon Gaster Memorial Fund, the National Illumination Committee Fund, and the International Illumination Congress Fund (1931) are presented. In each case the position differs only slightly from that recorded in the accounts for the previous year.

Relations With Other Bodies

In addition to the activities recorded above a considerable amount of work has been done by members of the Society in connection with other bodies. Many leading members of the Society serve on committees operating under the National Illumination Committee, the British Standards Institution and the Department of Scientific and Industrial Research. The Society also annually appoints representatives to serve on the National Illumination Committee. It will be recalled that a series of lectures on various aspects of illumination was arranged in London under the joint auspices of the two bodies in 1933. These lectures have since been published in volume form under the title of "A Symposium on Illumination."

At the request of the National Safety First Association a joint session of the Illuminating Engineering Society and the Association of Public Lighting Engineers is being arranged to take place in London on May 31, when a paper dealing with recent progress in street lighting in relation to safety will be delivered by Mr. S. B. Langlands.

Another opportunity for co-operation will be afforded during the twelfth Annual Meeting and Conference of the Association of Public Lighting Engineers, which is to be held in London during September 9-12. On this occasion a special invitation has been conveyed to members of the Illuminating Engineering Society to attend.

An event of considerable importance has been the formation of a Departmental Committee, operating under the Ministry of Transport, "to examine and report what steps could be taken for securing more efficient and uniform street lighting with particular reference to the convenience and safety of traffic." On this Committee four members of the Illuminating Engineering Society (Mr. J. F. Colquhoun, Mr. C. A. Masterman, Mr. C. C. Paterson, and Dr. J. W. T. Walsh) are serving.

During the Session the Illuminating Engineering Society, in common with other bodies, was invited to give evidence before this Committee. A Memorandum expressing the Society's view in regard to the importance of adequate street lighting, and

The Illuminating Engineering Society
32, VICTORIA STREET, LONDON, S.W.1

Dr. **INCOME AND EXPENDITURE ACCOUNT FOR THE YEAR ENDED 31st DECEMBER, 1934.** *Cr.*

EXPENDITURE.

	£ s. d.	£ s. d.
To Administration Expenses:—		
Rent, etc.	250 0 0	
Printing, etc.	131 10 8	
Duplicating	19 5 7	
General Expenses	63 13 4	
Hire of Halls for Meetings	48 3 0	
Reports and Lantern Operators ...	33 16 10	
Refreshments at Meetings	24 17 7	
Bank Charges	0 7 8	
Travelling Expenses	10 5 0	
Audit Fee	10 10 0	
		592 9 8
„ Annual Dinner	141 14 9	
Less Receipts	128 15 0	
		12 19 9
„ Illuminating Engineering Publishing Co., Ltd.—Share of Subscriptions ...		323 11 0
„ National Illumination Committee ...		32 0 0
„ British Standards Institution		10 10 0
„ Advisory Council of Building Trade ...		10 10 0
„ Excess of Income over Expenditure ...		238 13 4
		£1,220 13 9

INCOME.

	£ s. d.	£ s. d.
By Subscriptions*		1,158 9 3
„ „ outstanding (estimated)...		20 0 0
„ Interest on War Stock	42 0 0	
„ Interest on Deposit	0 4 6	
		42 4 6
		£1,220 13 9

*This sum includes the amount of £47 5 0 in respect of three Life Subscriptions.

BALANCE SHEET, 31st DECEMBER, 1934.

LIABILITIES.

	£ s. d.	£ s. d.
Creditors		33 3 1
Subscriptions paid in advance		12 1 6
Capital Account:—		
Balance from last Account	1,247 13 11	
Add Excess of Income over Expenditure for the year	238 13 4	
		1,486 7 3
		£1,531 11 10

ASSETS.

	£ s. d.	£ s. d.
Cash at Bank:—		
Current Account	174 10 1	
Deposit Account	100 0 10	
Cash in hand	0 9 5	
		275 0 4
£1,200 3½ per cent. Registered War Stock at cost		1,236 11 6
Subscriptions Outstanding		20 0 0
		£1,531 11 10

LEON GASTER MEMORIAL FUND ACCOUNT, 31st DECEMBER, 1934.

	£ s. d.	£ s. d.
Fund at the beginning of the year	250 6 2	
War Stock Interest	8 1 0	
Expended during the year:—		
Premium for 1934/35	10 10 0	
Cheque Book	0 0 10	
		10 10 10
Balance:—		
Cash at Bank	11 3 2	
Invested in £230 3½ per cent. Registered War Stock at cost	236 13 2	
		247 16 4
	£258 7 2	£258 7 2

NATIONAL ILLUMINATION COMMITTEE FUND, 31st DECEMBER, 1934.

	£ s. d.	£ s. d.
Fund at the beginning of the year	382 10 0	
War Stock Interest	10 10 0	
Deposit Interest...	10 3	
Sundry Receipts	16 12 11	
Balance:—		
Cash at Bank	105 14 8	
Invested in £300 3½ per cent. Registered War Stock at cost	304 8 6	
		410 3 2
	£410 3 2	£410 3 2

INTERNATIONAL ILLUMINATION CONGRESS FUND (1931), 31st DECEMBER, 1934.

	£ s. d.	£ s. d.
Fund at the beginning of the year	310 10 0	
War Stock Interest	10 10 0	
Balance:—		
Cash at Bank	16 11 6	
Invested in £300 3½ per cent. Registered War Stock at cost	304 8 6	
		321 0 0
	£321 0 0	£321 0 0

We have examined the above accounts with books and vouchers, and certify same to be correct in accordance therewith, and that the Balance Sheet exhibits a true and correct view of the Society's affairs according to the information and explanations given to us.

Dated this 25th day of March, 1935.

ROBERT J. WARD & CO., *Chartered Accountants*,
10, Serjeant's Inn,
Fleet Street, London, E.C.4.

making suggestions in regard to measures for its improvement, was issued by the Council and presented by a deputation consisting of five members, namely, Mr. S. B. Langlands (Vice-President), Mr. J. S. Dow (Hon. Secretary), Mr. F. C. Smith, Mr. E. Stroud, and Mr. G. H. Wilson, appointed by them to represent the Society.

Programme For Next Session

The programme for the 1935-36 Session is now in course of preparation, and it is desired to bring before the notice of members the importance of securing suitable papers. Offers and suggestions should now be sent to the Honorary Secretary. Papers of a descriptive or statistical nature will be considered, but contributions summarising the results of original investigation and research, such as would serve to enhance the prestige of the Society, are specially welcomed. Besides securing an improvement in the quality of papers the Papers Committee is anxious that manuscripts of papers should be received in good time before the opening of the Session in October next, so that ample time may be available to allot dates and to take any measures necessary in order to secure informative and successful meetings.

All papers read before the Society are eligible for the Leon Gaster Memorial Premium, which is awarded annually.

Entries for the Silver Jubilee Commemoration (1934) Award will also be welcome.

Suggestions for exhibits illustrating progress in illuminating engineering, for display at the Opening Meeting of the Session, are also requested. This display has proved to be a very popular item, and the number of exhibits tends to increase continually. What are particularly needed, however, are exhibits of a highly original and interesting character—so that this annual display may become recognised to afford an opportunity of seeing the very latest devices and instruments.

Suggestions for various types of extra meetings are being considered by the Council. Amongst such proposals may be mentioned the organisation of informal talks and discussions for the benefit of the younger members of the Society, and the arrangement of occasional lectures by experts on special fields of lighting.

Future Prospects

The brief discussion following the Presidential Address at the Opening Meeting revealed a feeling amongst members that the time is ripe to consider the future of the Society.

It seems clear that the realisation of the ideals of the Society demands a much greater membership; that this in turn is dependent on the Society extending its programme so as to make a wider appeal.

It has also been suggested that this widening of the scope of the Society, so as to make its proceedings of service to persons who are interested in applications of light but are not technicians, may render a change of name expedient.

In one direction, indicated in the Presidential Address—the necessity of measures to secure better publicity for the work of the Society—action has already been taken. On other matters, such as the proposed rearrangement of the journal so as to permit separate publication of the Transactions of the Society, the formation of a library of books dealing with illumination, and the award of a diploma for an elementary examination on Illumination (not, however, as a condition of membership) practical suggestions seem feasible.

It is proposed to issue a report dealing in detail with these various suggestions, on which the views of members will be invited at a special meeting to be held in the near future.

H. Hepworth Thompson (*President*).

John S. Dow (*Hon. Secretary*).

Public Lighting in the Irish Free State

An informative paper on "Street Lighting" was recently read by Mr. Francis X. Algar before the Institution of Civil Engineers of Ireland, and has since been reprinted. The earlier part of the paper dealt with street-lighting equipment in general terms (reference being made to the new electric discharge lamps), and explained in some detail the terms of the British Standard Specification for Street Lighting.

Whilst admittedly the Irish Free State has its own special needs, the author suggested that the adoption of some specification on similar lines to that in use in this country would be an advantage. The latter part of the paper surveying progress in the Irish Free State is of considerable interest. During the last completed year £120,000 (roughly, 9.6d. per head of population) was expended on street lighting, including new developments. About 74 per cent. of this sum related to electric lighting. The total of electric lamps in use was 17,500, of which about 70 per cent. are lighted, maintained, and operated by the Electricity Supply Board, which holds 185 contracts with local authorities. The author gives some particulars of lighting in Dublin and Cork. Dublin, with 5,500 electric lamps and 3,650 gas lamps, is the largest installation, but the lighting is not all that could be desired; standards having been erected in some cases many years ago, and spaced too far apart or irregularly. Attempts are, however, being made to improve matters. (Dublin, by the way, has an engineer specially appointed to control public lighting—the only holder of such an office in the Irish Free State!)

In Cork City an attempt has been made to design the lighting installation as a whole, and with fair success. Outside the big cities there are still many towns and villages, through which important roadways pass, where there is little or no street lighting. The author suggests that some central authority is necessary to ensure adequate lighting of all traffic routes.

Public Lighting

Help Needed by Rural Areas

The difficulty experienced by many parishes in meeting the expenditure involved in providing adequate public lighting, and the feeling that the State should come to the rescue in such cases, was illustrated by the following resolution, which was passed at a recent meeting of local government electors, held at the Council Schools, Stapleford (Cambridgeshire):—

"That this meeting of local government electors of the parish of Stapleford, in the county of Cambridgeshire, view with profound alarm the terrific expense thrust upon the whole of rural communities throughout the country by being compelled to adopt street lighting for the safety of His Majesty's subjects, and appeals for financial assistance from the Road Fund for the installation and annual upkeep of public lighting in rural areas, villages, etc.

"That a copy of this resolution be forwarded to the Press, the local Member of Parliament, the Ministry of Transport, the Cambridgeshire County Council, and the rural district and parish councils throughout the administrative county of Cambridgeshire for their support."

A Works Photo-Electric Method for the Photometry of Electric Discharge Lamps

By P. D. OAKLEY, B.Sc., F.I.C.

(Paper read at the Meeting of the Illuminating Engineering Society, held at the Institution of Mechanical Engineers, Storey's Gate, St. James's Park, London, S.W.1, at 6.30 p.m., on Tuesday, April 9th, 1935.)

The standpoint of this paper is definitely that of the Works rather than that of the pure research worker. As is well known, the introduction of the new light sources, having discontinuous spectra and departing very widely from the colour of the international standards of candle power, has raised many issues of a fundamental character. Research work on the basic problems is proceeding in many laboratories, and important papers have already been read before this Society.

It is clear that at present there exists considerable uncertainty as to the exact values to be assigned to discharge lamps, and yet the manufacturer is perforce impatient to have some means of controlling his product and of comparing the newer sources with one another and with ordinary incandescent lamps. The limiting accuracy obtainable in Works practice is always dependent on, and derived from, that of the research worker, but routine work of a repetition character has one advantage: it is possible to standardise a method, obtain good repeatability and control, and then progressively to improve the "level" or fundamental reliability of the result as more knowledge becomes available and is applied to the interpretation of the routine method.

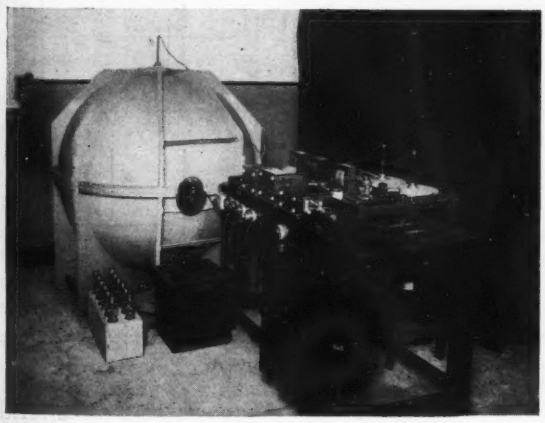


Fig. 1. General View of Apparatus.

For these reasons it was natural that, in setting out to establish a convenient Works routine for the measurement of high-pressure electric discharge lamps, we should turn our attention to a direct photo-electric method.

The lamps were of the high-pressure mercury type, with or without the addition of cadmium and zinc, to modify the colour. The degree of modification is usually expressed as the per cent. red light transmitted by a No. 25 Wratten filter.* For unmodified lamps this is about 1 per cent., and for colour modified lamps about 2.0 to 2.5 per cent. For reasons which need not be gone into, we inclined to the use of a rectifier type of photo-cell giving direct readings on a suitable micro-ammeter. It was recognised that caution would be necessary in interpreting the results, but as this applied with equal force to results produced by a single visual observer, it was not regarded as a deterrent argument.

The general arrangement of the apparatus is shown in the photograph (Fig. 1).

The sphere is 4 ft. in diameter and is provided with three interchangeable caps, each carrying its own lampholder. The two spare caps rest on a rack alongside the instrument bench and serve the purpose of running up further lamps while one is being measured. This provision is necessary, as about 10 min. are required to produce stability of lumen output. Normally, the bench occupies a position somewhat more forward than that in which it has been photographed; but it has been pushed back to show the photometer head.

The circuit arrangements are shown diagrammatically in Fig. 2. The lamps are operated on A.C. from a transformer giving steps of 10-volts. In each circuit, in addition to the choke, is included a 17-ohm series resistance for fine regulation, and a simple arrangement of plugs and switches enables the instruments—voltmeter, ammeter, and wattmeter—to be transferred from one circuit to another at will. It is important to know the running voltage of the lamp as well as the circuit voltage; it may also be useful to observe the choke voltage for special purposes: these requirements are met by the rotary voltmeter switch, which puts the voltmeter across the supply, the lamp or the choke, as desired. The pressure coil of the wattmeter is also switched by the same operation.

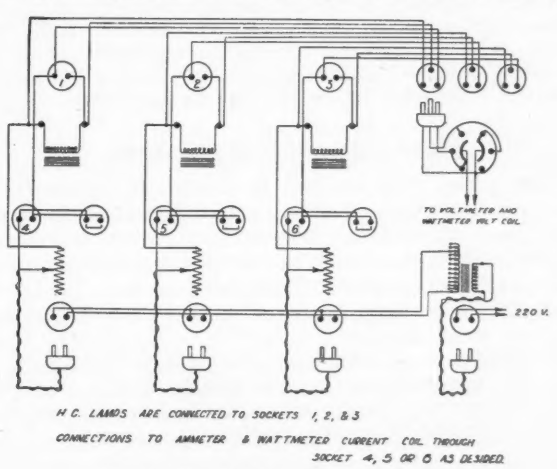


Fig. 2. Showing Arrangement of Circuit.

The photo-electric head was supplied by Arthur Pfeiffer, of Wetzlar, as a complete unit, though some small mechanical alterations were necessary for fitting to the sphere, and the opal window was replaced by Ilford diffusing medium. A brass collar let into

* Winch & Palmer, "Illuminating Engineering," April, 1934.

the sphere carries the window, which is held in position by a flat annular disc provided with bayonet catches for holding the head proper. In addition to the rectifier cell, this includes two adjustments, an iris diaphragm on the side adjacent to the sphere, and a rotatable plate carrying neutral absorbing discs on the side adjacent to the cell.

Nominally the ranges provided by the latter were X 1, X 10, and X 100. The X 10 range was found to be the most convenient to give a reasonable adjustment of the iris for lamps of the kind which it was desired to measure.

Before proceeding to a detailed description of the methods employed for calibrating this apparatus, it is necessary to make clear the viewpoint from which it was regarded. We understood from the agent that the photo-cell had a spectral response curve not far removed from that of the average eye, but no actual curve was available, and it did not fall within the province of this work to investigate the cell in detail. It was recognised that most cells of this type tend to be red sensitive, and previous experience of the Pfeiffer cell seemed to confirm this property. At the same time, it seemed reasonable to assume that in measuring lamps of a particular kind with a very small range of variation in colour, it would be found possible to calibrate a standard of the same kind as the lamps to be measured and obtain result of reasonable accuracy

During the first phase of calibration, the photometer was called upon to measure only lamps having an addition of cadmium and zinc and giving about 2.0 to 2.5 per cent. red transmission through a Wratten Filter No. 25. Later on, it became necessary to measure also mercury lamps without such addition, and at that juncture the problem of the character of the cell response to different qualities of light became of dominant importance, and, as will be shown later, it became evident that the errors involved in the earlier assumption were by no means negligible.

As a temporary measure, the photometer was set up from Tungsten Standards, and the error in measuring discharge lamps was allowed for by using a correction factor based on lamps of the same kind measured at the N.P.L.

During the second phase, it became necessary to determine the reliability of the cell in measuring not only lamps of 2.0 to 2.5 per cent. red, but plain high pressure mercury lamps of about 1 per cent. red and other lamps having more than 2.5 per cent. red. It was, therefore, necessary to have some means of calibrating, with reasonable visual accuracy, a series of electric discharge lamps for use as standards.

Visual Calibration of Standards.

The paper read by Mr. H. Buckley* before this Society last year exercised a considerable influence on this work, and the following conditions were regarded as fundamental to the visual calibration:—

(1) The use of a 2° field.

(2) Field brightness of more than 25-metre candles.

(3) Determination of photometric balance at approximate colour match, using a filter whose transmission value has been determined by spectro-photometric means.

(4) Correction of the results for the $\frac{Y}{B}$ value of the observers to obtain the value corresponding with $\frac{Y}{B} = 1$.

(5) The use of non-selective paint.

Four observers were available having $\frac{Y}{B}$ ratios—.78, .93, .95, and 1.02—but it was not possible to find one who was definitely red sensitive. A filter, suitable for reducing tungsten radiation at 2600° K to an approximate colour match with the high-pressure mercury lamp, was provided and calibrated spectrophotometrically, by the courtesy of the General Electric Company's Research Laboratories, with whom we have had the pleasure of conducting some intercomparison tests, which will be referred to later The visual measurements were carried out using a 1-metre cube as integrator, a comparison lamp of 2600° K, and a Lummer-Brodhun contrast head, converted to approximately a 2° field by the use of a negative lens in place of the normal eye-piece.

With regard to the non-selective paint, it was felt that some measure of the effect of departures from a

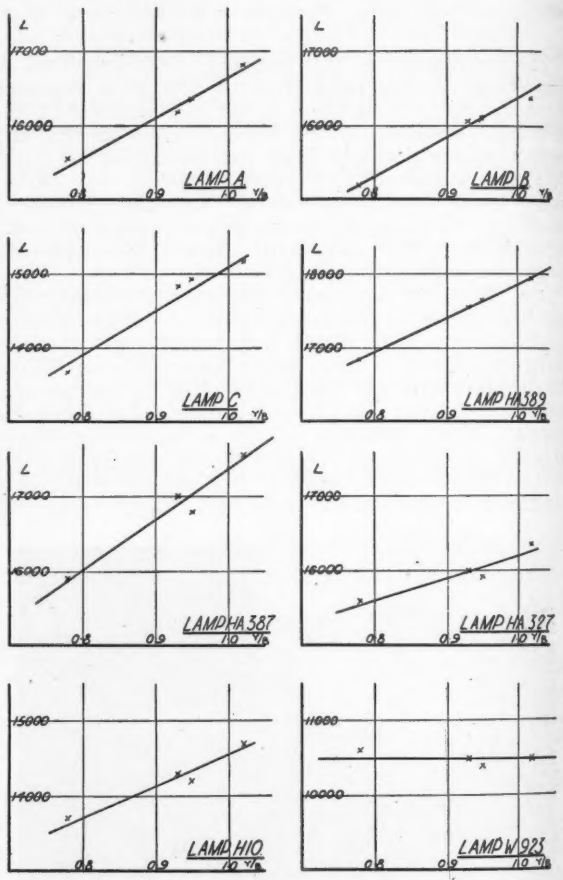


Fig. 3.

true white might be of assistance, and three series of measurements were taken, using paint of slightly different colour. In the first series the paint had a yellowish tinge, in the second a bluish tinge, and in the third complied with the B.S.S. No. 354, though very slightly bluish.

To begin with, it was decided to calibrate seven 400-watt mercury lamps, three of which formed part of an inter-comparison with other laboratories, and one 400-watt colour modified lamp which had been aged for several hundred hours, and then measured at the N.P.L. The main results of this work may be briefly summarised:—

(1) The relative values for the different lamps remained very consistent both as regards the various observers and as regards the modifications of integrator paint.

It was thus possible to determine a "level" corresponding with each series, i.e., with each quality of paint.

(2) The "level" based on a photometric set-up from Tungsten Standards was affected considerably by the colour of the paint, but an approximately linear relationship appeared to exist between the per cent. change in comparison lamp voltage in the paint

* "Illuminating Engineer," April and May, 1934.

test and the level obtained on the gas discharge lamp measurements.

It was thus possible to make a slight further correction on the results obtained with the nearly white paint.

(3) This work provided a series of standardised lamps with which the photo-electric photometer could be further explored.

The results for the seven mercury lamps will first be considered.

The Calibration of H.P. Mercury Lamps.

Table I. gives the observations taken with substantially white paint. Each lumen value represents the mean of five readings. The relation between the individual lamps and the average for the batch is very consistent for the various observers. This was also true for the similar readings taken with yellowish and bluish paint, which altered the level, but not the relation, between the lamps.

It will be noticed that the $\frac{Y}{B}$ lines have considerable slopes, which correspond with apparent temperature differences ranging from 500° to 1,000°, the test lamp being the redder*. This was somewhat surprising as we knew that the filter had been chosen so

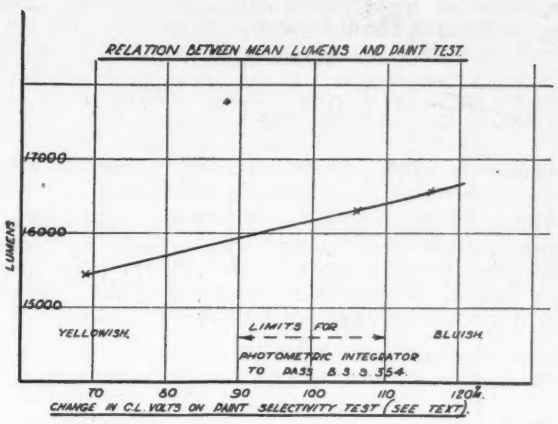


Fig. 4.

series, co-ordinated with the result of the paint selectivity tests.

In a similar way, the individual lamp results were plotted to find the value corresponding with non-selective paint. The values finally assigned to the lamps were, therefore:—

A	B	C	HA389	HA387	HA327	H10
16680	16150	14980	17550	17100	16150	14500

Of these lamps, A, B, and C formed part of an intertest with other laboratories and were, therefore, not available for further work. The other four lamps were set aside as standards, H10, being treated as the master standard as it had been burned longest and was considered least likely to change. It is burned as little as possible, being only used to check the others. HA389 is used about once per week and the others daily. The values of H10 and HA389 have apparently remained constant for several months, but the daily standards have fallen somewhat in light output and been re-calibrated from time to time.

Table I.

Observer		I.		II.		III.		IV.		"Normal" (by plotting)	
$\frac{Y}{B}$		0.78		0.93		0.95		1.02		1.00	
Lamp	Lumens	% Mean of Batch	Lumens	% Mean of Batch	Lumens	% Mean of Batch	Lumens	% Mean of Batch	Lumens	% Mean of Batch
A	15,560	102.3	16,180	101.2	16,350	102.3	16,820	102.4	16,650	102.2
B	15,200	99.9	16,060	100.4	16,100	100.7	16,380	99.8	16,350	100.4
C	13 670	89.9	14,830	92.7	14,930	93.4	15,180	92.4	15,100	92.7
HA389	16,840	110.7	17,550	109.8	17,650	110.3	17,950	109.4	17,850	109.6
HA387	15,900	104.5	17,000	106.3	16,800	105.0	17,550	106.9	17,350	106.5
HA327	15,600	102.6	16,000	100.1	15,920	99.5	16,350	99.6	16,200	99.5
H10	13,700	90.1	14,300	89.4	14,200	88.8	14,700	89.5	14,550	89.3
Mean of Batch	15,210		15,990		15,990		16,420		16,290	

The value for unity $\frac{Y}{B}$ was obtained by plotting as shown in Fig. 3.

that when used in front of a tungsten lamp at 2,600°K it gave a reasonable colour match to the light from a high pressure mercury lamp. It was suggested that the integrator point caused the difference, but this does not seem reasonable in view of the very small colour distortion produced by the integrator on tungsten radiation for series 3. At the moment, this anomaly is not satisfactorily cleared up.

Table II.

Series	Colour of Integrator Surface	Volts on C.L. to give colour match with tungsten lamp in cube as % C.L. volts to match the same lamp horizontally	Mean lumens of 7 high-pressure Hg lamps
1	Yellowish	69%	15,480 L
2	Bluish	116%	16,540
3	Slightly Bluish	106%	16,290
Estimated value for non-selective (white)		100%	16,160 †

† Obtained by plotting. See Fig. 4.

Table II. shows the collected results for the three

* See G. T. Winch and E. H. Palmer. Ill. Eng., July, 1934.

Calibration of Colour Modified Lamps.

In the foregoing description, reference has so far been made only to high pressure lamps containing mercury, but not cadmium or zinc. Included in the experiments there was, however, a colour modified lamp No. W. 923 which had previously been measured by the N.P.L. The values obtained by the four

observers for the measurements taken at the same time as those of Table I. were:—

Table III.

$\frac{Y}{B}$	0.78	0.93	0.95	1.02	Mean
Lumens	10,600	10,500	10,400	10,500	10,500

These are also plotted on Fig. 3 and indicate that a much better colour match was obtained when using the colour modified lamps than with the plain mercury lamps. The average results for the various conditions of measurement are shown in Table IV.

Table IV.

Paint	Lumens	Ratio to mean of 7 Hg Lamps
Yellowish ...	10,290	0.664
Bluish	11,000	0.665
Slightly Bluish ...	10,500	0.644
Estimated for non-selective paint ...	10,600	0.656
N.P.L. Value for W.923 =	10,450 Lumens	1.6% red.

The close approximation of this result to the N.P.L. value was considered as giving a useful confirmation that the calibration was proceeding on sound lines. The next step was to calibrate a number of "W" type (colour modified) lamps. These lamps contained both zinc and cadmium in addition to mercury and about 2.0 to 2.5 per cent. of the their total light was transmitted by a Wratten No. 25 filter.

The position was somewhat different from that regarding mercury lamps, for two reasons. In the first place, two other lamps were available which had been measured by the N.P.L., though they were not very well stabilised and could not, therefore, be expected to serve as real standards. In the second place, colour modified lamps are subject to a certain variation in luminous output according to the degree to which colour modification also varies. While these changes are not of great significance from the commercial point of view, they must be allowed for in accurate measurement. One method is to establish a curve for variation in luminous output with per cent. red. This, however, involves difficulties in regard to photo-electric calibration and can only usefully be applied when the performance of the cell is fairly well established. It seemed better, therefore, to base the calibration on the average of a number of lamps and to leave fortuitous variations to cancel one another out.

The experience in measuring W.923 suggested that the filter already used for the plain mercury lamps would be even better for colour modified lamps as it gave a very close approximation to colour match. This is confirmed by Fig. 3 where the horizontal line for W.923 contrasts with the considerable slope for the other lamps. Table V gives the detailed results for three lamps of approximately 1.6 to 2.0 per cent. red, including a re-measurement of lamp W.923 which had already been measured with the mercury lamps.

Table V.

Lamp	Observer Y/B	I. 0.78	II. 0.93	III. 0.95	IV. 1.02	Normal 1.0
W.1958		12,000	11,800	11,500	12,050	11,840
W.1964		13,400	13,150	12,700	13,350	13,150
W.923		10,820	10,520	10,450	10,600	10,600
Average of 3 lamps		12,070	11,820	11,530	12,000	11,860

The value given for a normal observer is the average of the four individual readings in each case as the best line which could be drawn when the points were plotted was horizontal. Other lamps of somewhat higher per cent. red were similarly calibrated, and thus a whole series of lamps became available. It is unnecessary to give all the detailed observers' readings, but the final visual results are listed in Table VI.

Table VI.

Lamp No.	Measured at	Approx. % Red	Total Lumens
923	N.P.L.	1.6	10,450
371	,,	(2.0)	13,200
574	,,	(2.0)	13,050
			Average 12,230
923	Preston	1.6	10,600
1,958	,,	1.8	11,840
1,964	,,	1.9	13,150
			Average 11,860
1,838	,,	2.5	10,670
1,847	,,	2.2	9,780
			Average 10,225
2,002	,,	3.4	10,480

It now remained to use the various standards to check the photo-electric photometer and find a suitable filter for routine use.

Tests on Photo-Cell Using X 10 Stop But Without Filter.

This was the condition in which early trials had been made. Although it was expected that anomalies would be shown up by using the lamps now available, the actual extent of the variation came as a surprise. With the photometer set by a 500 W Tungsten standard, the results shown in Table VII. were obtained.

Table VII.

Lamp No.	Visual Value	P.E. Value	P.E. Value of % Visual Value
H.10	14,500	13,400	92.4
H.A.327	16,150	15,050	93.2
387	17,100	15,400	90.0
389	17,550	16,150	92.0
Av. 4 Mercury Lamps	16,325	15,000	91.9%
W.923	10,600 (Preston)	11,000	103.8 (of Preston Visual Value)
1,958	11,840	12,050	101.8
1,964	13,150	14,000	106.5
Av. 3 "W" Lamps	11,860	12,350	104.1%

Experiments were then made with various filters. It was soon found that a yellowish filter was the kind required to correct the cell response. From the results given in Table VII., if F_H represents the ratio between the photo-electric and visual readings for the H lamps and F_W represents this ratio for W lamps, then for the cell without filter

$$\frac{F_W}{F_H} = 1.13.$$

Taking a particular pair of lamps, H10 and W923, and measuring them with various filters interposed

between the sphere window and the photo-cell, the ratio $\frac{F_{W_{923}}}{F_{H_{10}}}$ was determined. The results are given in Table VIII.

Table VIII.

Filter	Ratio $\frac{F_{W_{923}}}{F_{H_{10}}}$
None	1.16
Wratten 78A	1.19
78B	1.18
78C	1.17
86	0.985
86A	1.09
86B	1.10
86C	1.13

It was considered that the result for Filter 86 was very satisfactory, as, obviously, the 1.5 per cent. discrepancy could be divided between the two classes of lamp, leaving both on a basis that should agree

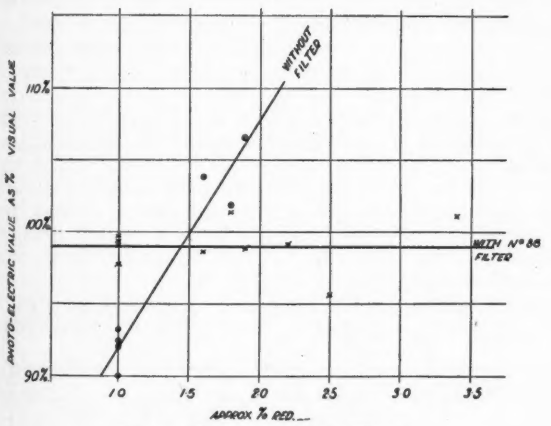


Fig. 5. Readings without Filter O.
" " " X.

within 1 per cent. of the visual value.

Though a good many other yellow filters have since been tested, none has proved so satisfactory as the Wratten No. 86. Table IX. shows typical results,

Table IX.

Lamp No.	Approx. % Red	Visual Value	P.E. Value using Wratten Filter No. 86	P.E. / Visual × 100
H. 10		14,500	14,400	99.3
327		16,150	16,100	99.7
387		17,100	16,700	97.7
389		17,550	17,400	99.1
		16,325	16,150	98.9%
923	1.6	10,450 (N.P.L.)	10,450	100%
371	2.0	13,200 "	12,800	97%
574	2.0	13,050 "	12,900	98.9%
		12,230	12,050	98.5%
W. 923	1.6	10,600 (Preston)	10,450	98.6%
1,958	1.8	11,840	12,000	101.4%
1,964	1.9	13,150	13,000	98.9%
		11,860	11,815	99.6%
1,838	2.5	10,670	10,200	95.6%
1,847	2.2	9,780	9,700	99.2
		10,225	9,950	97.3
2,002	3.4	10,480	10,600	101.1%

obtained by using H.10 as a standard for setting up. They are also plotted in Fig. 5, together with those of Table VII.

It was considered that these results were a satisfactory confirmation of the suitability of Filter 86 over a good range of variation in per cent. red.

The actual set up on this occasion was about 1 per cent. low, but clearly there is no evidence of a slope in passing from one degree of colour modification to another. The level has been maintained in practice by the use of plain mercury lamps for a daily check on the set up, which for convenience is made by means of a tungsten lamp. The daily standards are controlled by others which are burned only once per week, and these again by the most stable and rarely used standard H10. The relation between H and W lamps is checked by the periodical measurement of the W check lamps. The filter is controlled by a master filter of the same kind. Though not quite stable, there is no evidence that several months' use of one filter has caused any disturbance of the F_W / F_H ratio.

A recent test was made in which a series of lamps for an inter-comparison with other laboratories was measured, first on the photo-electric photometer by the standard method, and afterwards visually, using the same observers as for the earlier work. The mean result of the P.E. measurement was 0.5 per cent. higher than the visual and within 1 per cent. of the mean result obtained by three independent laboratories.

Further work is proceeding, and there is some indication that a combination filter consisting of a yellow glass and another glass having strong absorption in the infra red may make it possible to correct the cell in such a way that Tungsten or high pressure gas discharge lamps, both mercury and colour modified, can be measured on the same basis.

It remains to add a word regarding the measurement of per cent. red. At the moment, this is based on the relationship empirically determined for the cell response, using the X 1 stop for a series of lamps of which the red lumens had been measured visually. Over a small range this enables one to recognise and allow for variation in the W standards, but search is being made for a more satisfactory method which will put the photo-electric measurement of red lumens on an equally satisfactory basis to that of total lumens.

The author wishes to express his thanks to Siemens Electric Lamps and Supplies, Ltd., for permission to publish this work and to his colleagues, especially Mr. J. E. Askew and Mr. J. N. Aldington, for much assistance in carrying it out and in the preparation of the paper.

E.L.M.A. Lighting Service Bureau

Recent Activities

We hear that the 31st Illumination Design Course in London, to which reference was made in our last issue, was very successful, more reservations being received than ever before. About 70 supply undertakings were represented. Besides the lectures previously enumerated, visits were paid to The National Gallery, Unilever House, Wyndham's Theatre, Battersea Power Station and the new R.I.B.A. Building. Those participating in the course were also afforded an apportunity of hearing Dr. Pirani's address to the Illuminating Engineering Society on May 14th. It may be recalled that a similar but shorter course was arranged in Cardiff during March 28th and 29th.

Enterprising work is also being done by the Touring Demonstration Van, which visited Spalding, Hove and Andover in April and was occupied in Cornwall (Liskeard, Newquay, Penzance, Redruth, and Truro) during the middle part of May.

A Simple System for Recording and Displaying Measurements of Illumination

By R. R. HOLMES, M.Sc., A.C.G.I., D.I.C.

(Paper read at the meeting of the Illuminating Engineering Society, held at the Institution of Mechanical Engineers, Storey's Gate, St. James's Park, London, S.W.1, at 6.30 p.m., on Tuesday, April 9th, 1935.)

It is only fitting that here, at the very outset, I should insist on expressing my sincere thanks for the assistance in the preparation of the apparatus and in the taking of the readings which the Lighting Service Bureau has so kindly given me.

Stress has been laid in recent months on the desirability of a closer understanding between the lighting engineer and the architect: of very similar importance is the degree of understanding between the lighting engineer and his employer or customer.

The system which is to be described is an attempt to find a form of expressing the illumination on a surface which will be useful and intelligible both to the lighting engineer and the comparative "layman" (as regards technical matters) for whom he is working.

The difficulty which lies at the root of the problem is that the actual representation of the surface itself on a sheet of paper uses up the only two dimensions which can be represented (in the ordinary way) on a single plane; thus no third dimension is left in which to express the value of the illumination.

Heretofore the illumination has been indicated by superimposing on the drawing of the surface a number of irregular lines—each line passing through points of equal illumination and having a number against it giving the actual value of that illumination—just as on a contour map the irregular lines pass through points of equal altitude and have the corresponding height marked against them. This diagram, termed an "Isolux" diagram, conveys its information by means of the numbers written against the lines and the relative positions of the lines themselves.

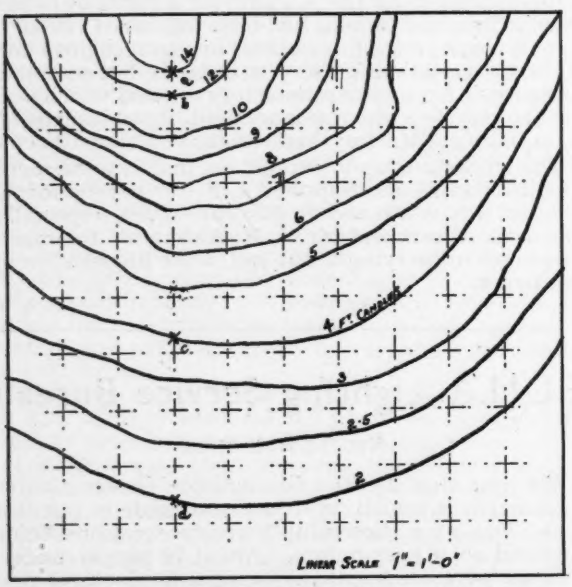


Fig. 1. Typical Isolux Diagram (81 observations).

Such a diagram is shown on Fig 1: it will be realised that it is necessary to scan most of the numbers and the relative positions of the lines in order to obtain a satisfactory idea of the distribution of the light over the surface. For instance in Fig. 1 there is a fall of 2 foot-candles between the points (a) and (b) which are only 2 ins. apart, whereas between points (c) and (d) the fall is also 2 foot-candles, but the distance is 18 ins. The scanning of the numbers and the judging of the distances between the lines will come easily to anyone thoroughly familiar with the subject, but an outsider, who possibly has not had occasion to deal with such a diagram before, may well be uncertain as to the correct interpretation.

From the practical point of view it will also be realised that if satisfactory shapes for the curves are to be obtained, it is essential for the observation points to be closely spaced—in normal circumstances every foot or so.

Now the new system, while requiring fewer readings, attempts to convey the nature of the distribution of light over the surface direct to the eye without the necessity of reading numbers and co-relating the positions of irregular lines: in fact it avoids the drawing of irregular lines altogether, which greatly simplifies the plotting of the diagram from the draughtsman's point of view.

Fig 2. shows the "Circle-lux" diagram, as I have for the moment called it, drawn for the same conditions as were represented by the Isolux diagram on Fig 1. It will at once be noticed that the spacing of the readings on the Circle-lux diagram is double that on the Isolux diagram, and that less than one-third of the number of readings is required. The circles which surround the observation points have been so drawn that *the area of each circle is proportional to the illumination at that point.*

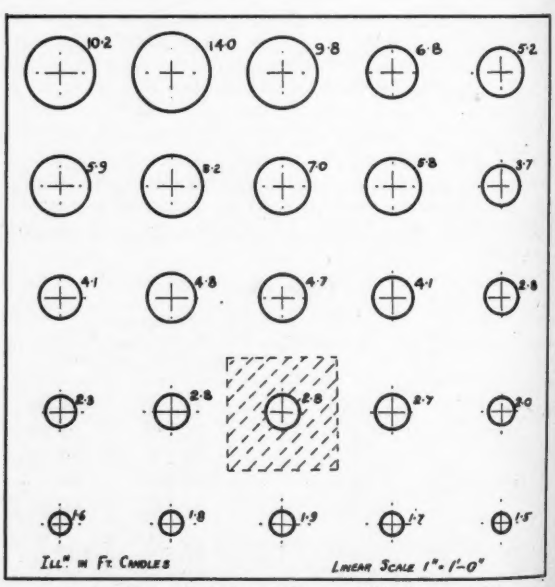


Fig. 2. Typical Circle-lux Diagram (25 observations).

Thus a third dimension has been found in which to express the value of the illumination, in spite of the fact that the diagram still occupies a single plane; once this convention is accepted—the expression of

the illumination at a point by a circle round that point whose area is directly proportional to the illumination—such a diagram conveys to the eye *instantly* the distribution of the light over the surface. The actual values are written against the circles for reference and indicate the scale of the diagram.

The regular spacing of the observation points, it will be noted, obviates the necessity of comparing two unequal distances and the corresponding illumination figures, as has to be done on the Isolux diagram.

The total flux on any particular area can be easily found if the assumption be made that the illumination at any observation point is the average illumination over a square area about the point such as that shaded on Fig. 2; in many cases such an assumption would be justified if the spacing of the readings had been chosen with due regard to the accuracy required.

The main importance of the diagram is, however, the fact that no technical knowledge is necessary to appreciate its significance, and that there is a definite and recognisable relation between the appearance of the diagram and the appearance of the lighted surface which it represents.

This resemblance will now be made clear by a simple demonstration.

On this surface, five feet square, a certain illumination is being produced, and the representation of this on an Isolux diagram and a Circle-lux diagram is also shown on Figs. 5 and 6: the former diagram took 1.33 hours to prepare and the latter 0.5 hours. Yet one more example will be given with the corresponding diagrams, Figs. 8 and 9: the times in this case were respectively 1.61 hours and 0.41 hours.

The actual calculation of the radii of the circles is

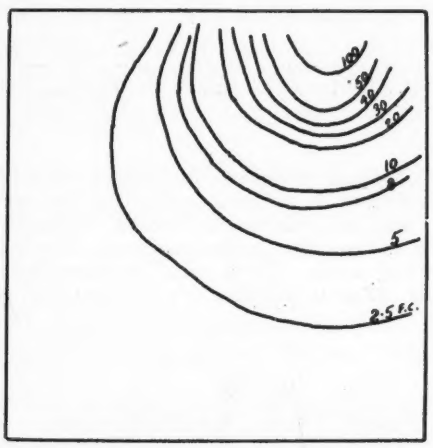


Fig. 5. Experiment No. 27: Isolux Diagram. Time (including Readings)=1.33 Hours.

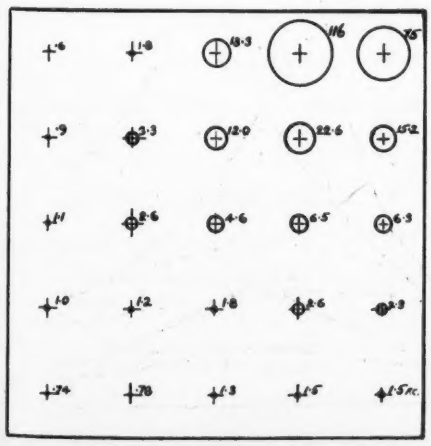


Fig. 6. Experiment No. 27: Circle-lux Diagram. Time (including Readings)=0.5 Hours.

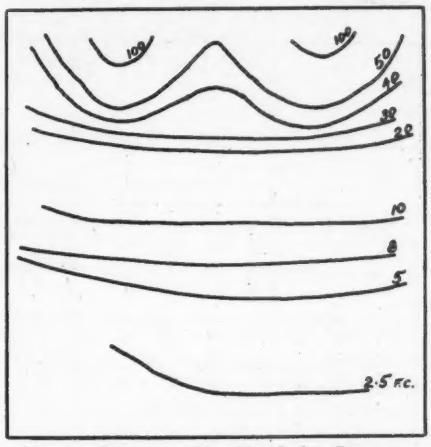


Fig. 8. Experiment No. 28: Isolux Diagram. Time (including Readings)=1.61 Hours.

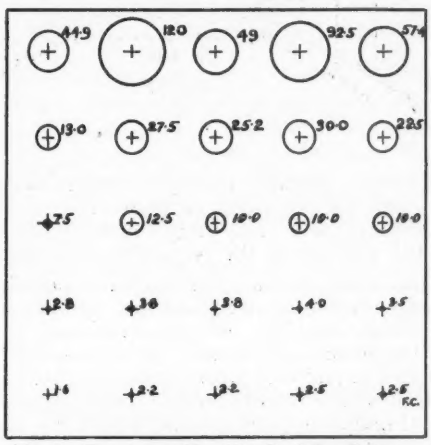


Fig. 9. Experiment No. 28: Circle-lux Diagram. Time (including Readings)=0.4 Hours.

accomplished very simply on a slide-rule from the following formula:—

$$r = c\sqrt{I}$$

where r is the radius of the circle required;
I is the illumination at the point;
c is a constant so chosen that the circles are not too crowded on the diagram.

Fig. 10 shows a Circle-lux diagram as used in prac-

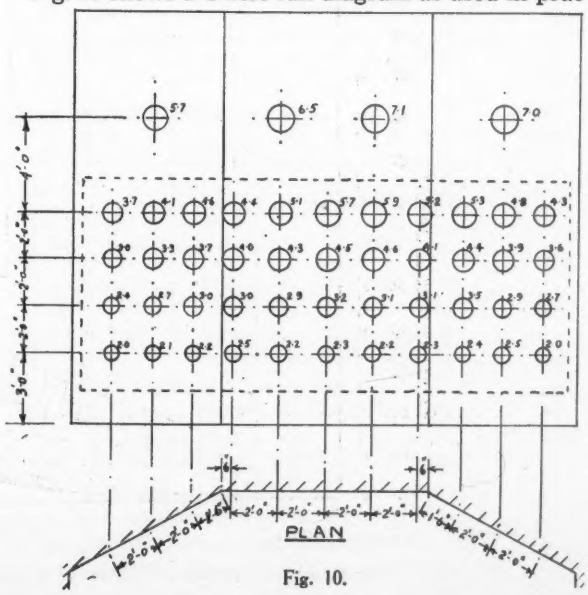


Fig. 10.

tice: the illumination on the wall of a picture gallery is being studied. Fig. 11 shows the illumination on a similar wall from an alternative set of lighting equipment. These diagrams were found to be readily

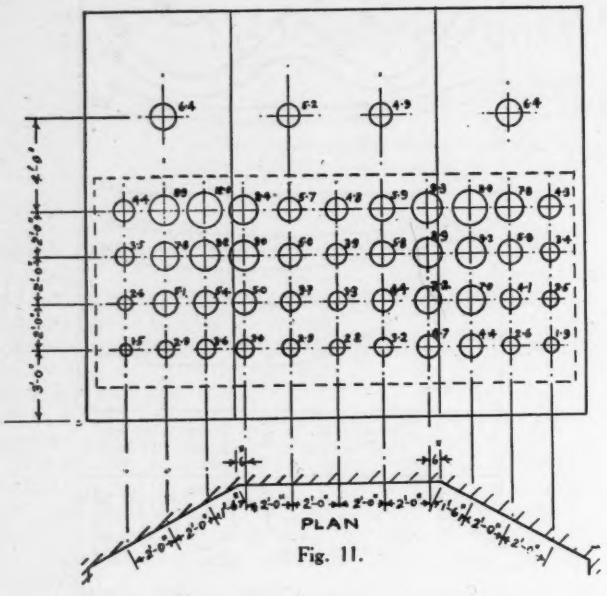


Fig. 11.

understood by persons unacquainted with technical matters and the relative performance of the two systems could be clearly demonstrated by superimposing the tracings of the respective diagrams.

It is not intended that this diagram should entirely supersede the Isolux diagram, for the latter, owing to the closer spacing of readings and the "continuity" of record afforded by the curves, does contain the greater amount of information; but it is intended to be used where results have to be explained to non-technical bodies or persons, and where the time spent on Isolux diagrams would not be adequately repaid.

In conclusion it must be mentioned that the system is being brought to the Society's notice at the earliest available opportunity, and your indulgence is craved for the incomplete treatment which it has been given here. It was, quite definitely, invented to meet a particular practical need, and it is by its usefulness and not by its theoretical basis that the author would have it stand or fall.

APPENDIX.

In order to obtain the Iso-lux Diagrams shown on Figures 5 and 8 it was necessary to take readings at the 81 points marked on the reference diagram shown here on Fig. 3. Even at this close spacing the

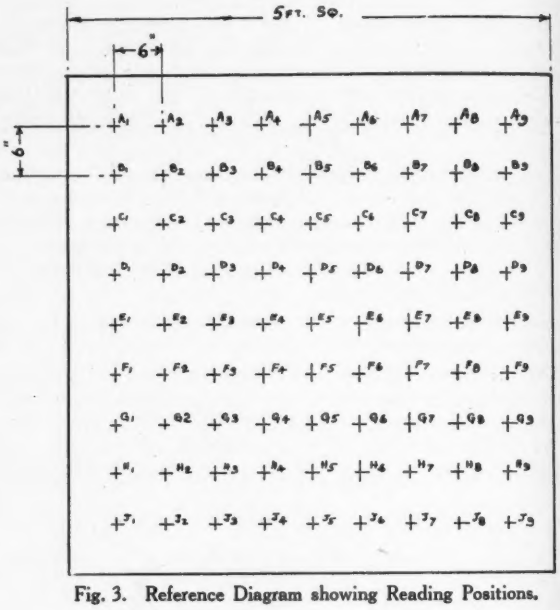


Fig. 3. Reference Diagram showing Reading Positions.

values changed so rapidly from point to point that it was necessary to prepare a chart of the readings in each case, as illustrated in Fig. 4 below, before starting to draw the Iso-lux diagram. The time taken in plotting these charts was therefore included in the time taken to prepare the Iso-lux diagram.

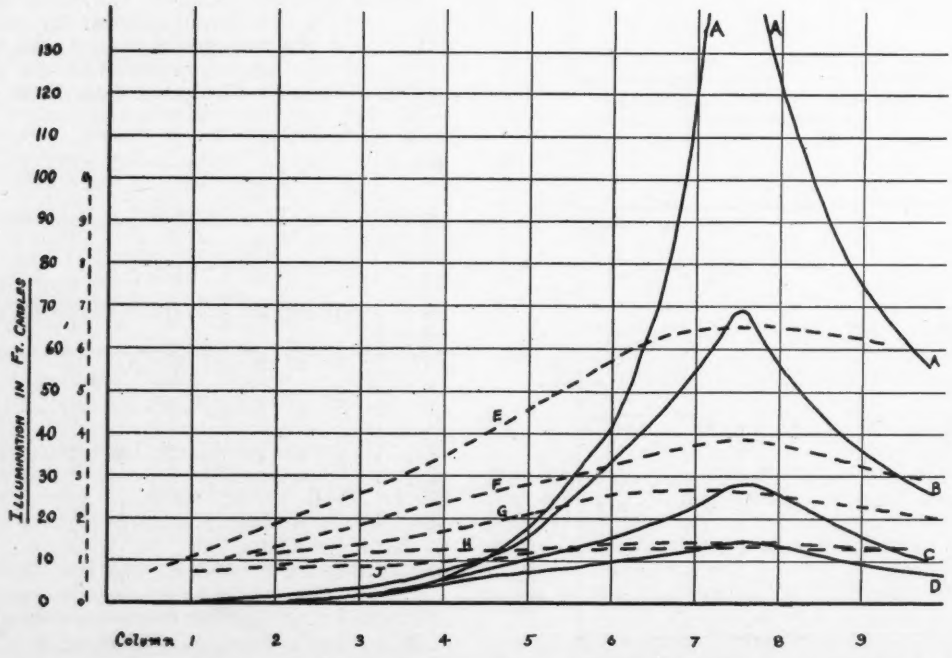


Fig. 4. Experiment No. 27: Chart of Readings—Plotting Time, 22 mins.: Total Time, 29. mins.

Literature on Lighting

(Abstracts of Recent Articles on Illumination and Photometry in the Technical Press)

(Continued from page 163, May, 1935.)

I.—RADIATION AND GENERAL PHYSICS.

163. Infrared Transmission of Radiation by Water Vapour.

F. E. Fowle. Am. Illum. Eng. Soc., Trans. 30, pp. 273-280.

Discusses methods of determining the water-vapour content of the atmosphere. A spectroscopic method is described, and data are given on the relation between the amount of water vapour present and the transmission. G. H. W.

II.—PHOTOMETRY.

164. Apparatus for Measuring Very Low Brightness.

Maurice Roulleau. Revue d'Optique, Vol. 13, No. 11, p. 375, November, 1934.

The apparatus consists of a box, closed at one end by an opal glass screen, illuminated from inside the box, and whose brightness is variable. The brightness is calibrated in terms of the aperture of an internal diaphragm. R. G. H.

165. Photoelectric Illumination Meter.

Anon. (presented by Société Prolabo). Revue d'Optique, Vol. 13, No. 12, p. 413, December, 1934.

Describes a photo-electric illumination meter with two ranges of sensitivity. R. G. H.

166. An Electrical Test Recorder.

G. Chelioti. G.E.C. Journal, VI., pp. 107-111, May, 1935.

A description is given of apparatus, self-recording in character, with which accelerated life tests on electric lamps can be conducted. Results obtained are subsequently interpreted for normal conditions. C. A. M.

167. Recent Measurements of the Brightness of the Clear North Sky in Washington, D.C.

J. E. Ives and F. L. Knowles. Am. Illum. Eng. Soc., Trans. 30, pp. 281-291.

Brightness data are given for eighteen segments of the North Sky for various times of day from 8 a.m. to 4 p.m., and for various months in the year. The average results are usefully analysed. G. H. W.

III.—SOURCES OF LIGHT.

168. A New Street Electric Lamp.

E. Jones. Elect., 114, p. 551, April 26, 1935.

A brief reference is made to a new electric lamp recently demonstrated in Liverpool. It is claimed to be non-dazzling, to cast no shadows, and to effect considerable economy. It is proposed to mount it on posts only 30 in. high. C. A. M.

169. A New High-pressure Mercury Vapour Lamp.

Licht u. Lamp, 24, No. 7, p. 177, March 28, 1935.

A description is given of a new super-high-pressure lamp. Pressures up to 300 atmospheres are used. Efficiency is increased, a lamp at 150 atms. giving a surface brightness of 28,000 Hefner candles per c.m.2. Another advantage is that more red light is given than with the usual Hg. vapour lamps, and the light therefore approximates more to daylight. A photograph shows one type of the new lamp, which is about the size of a man's thumb. E. S. B.-S.

170. Monochromatic Lighting.

G. Heller. Elect., 114, pp. 547-548, April 26, 1935.

Physiological phenomena, associated with visibility in street lighting installations equipped with monochromatic sources, are discussed. Curves are given of radiation power (sic), including contrast efficiency (sic), of monochromatically radiating surfaces as a function of the wave-length. A comparison of brightness of objects resulting from sodium and other sources is made. A recommendation of minimum brightness and flux distribution over the road surface is made for sodium street lighting. C. A. M.

171. Light Production and Change of Wave-length by Phosphorescence.

Licht u. Lampe, 24, No. 6, p. 158, March 14, 1935.

At the meeting of the Deutsche Lichttechnische Gesellschaft on February 28, Dr. Larche described the mechanics of the production of light by phosphorescence, and then dealt with its applications. He described new lamps constructed with phosphorus contained inside the bulbs. E. S. B.-S.

172. Colour Testing Apparatus.

Anon. Elect., 114, pp. 584-585, May 3, 1935.

A brief description is given of a new apparatus for the testing of colour constancy. A 750-w. lamp, using quartz glass, is employed as the light source. Illumination values as high as 500,000-foot candles are obtained. C. A. M.

173. New Flashlight Lamp.

J. A. M. van Liempt and J. A. de Vriend. Revue d'Optique, Vol. 14, No. 1, p. 18, January, 1935.

Describes a new flashlight bulb for photographic work. Measurements are given of the light output, of the spectral emission, and of the light intensity as a function of time. R. G. H.

IV.—LIGHTING EQUIPMENT.

174. Jubilee Lighting Equipment.

Anon. Electrical Review, 116, p. 414, March 22, 1935.

Describes, with photographs, decorative units and floodlighting units for the Jubilee celebrations. R. G. H.

175. A New Gas Floodlighting Unit.

Gas World, May 4; Gas. Jour., May 8, 1935.

This new apparatus is described and illustrated. J. G. C.

V.—APPLICATIONS OF LIGHT.

176. Modern Lighting Installations.

Am. Illum. Eng. Soc., Trans. 30, pp. 247-254, March, 1935.

Illustrated descriptions of seven modern lighting installations.

177. A Method of Calculating the Efficiency of Artificial Interior Lighting.

E. Meyer. Licht u. Lampe, 24, No. 8, p. 197, April 11, 1935; No. 9, p. 219. April 25, 1935.

Graphs and tables are given from which factors analogous to coefficients of utilisation can be obtained for various types of room and light source. E. S. B.-S.

178. Adequate Lighting is a Sound Investment.

L. A. S. Wood, Elect. Engineering, 54, pp. 421-423, April, 1935.

A number of examples in which an increased intensity of illumination in industrial establishments resulted in an actual increase in production are cited in this paper. Other results also attributed to adequate lighting are that better work can be done, accidents are reduced, and waste space may be available for production. S. S. B.

179. Public Transport Service Lighting.

Anon. El. Times, 87, p. 583, April 25, 1935.

An account, with photographs, of recent installations in various public transport stations, with particular reference to electric discharge lamps. W. R. S.

180. Sodium Vapour Lamps Light Jersey Road (U.S.A.).

Anon. El. World, 105, p. 387. February 16, 1935.

The article gives some information on the mile of sodium vapour lamps street-lighting recently opened as a demonstration installation. The lighting scheme can be varied for purposes of comparison. S. S. B.

181. Street Lighting Problems.

Gas Times. April 22, 1935.

Summary of a paper on the above subject. J. G. C.

182. Gas Lighting in the East.

Gas Age Record. April 6 and 27, 1935.

Descriptions of gas lighting in the streets of Port Said and Cairo. J. G. C.

183. Combines Beauty and Utility in Auditorium Lighting.

A. L. Powell. El. World. 105, pp. 576-577, March 16, 1935.

The article describes the lighting installed in an auditorium in New York. Unusual colour effects are obtained, using gas discharge lamps. A detailed description of the scheme, with photographs, is given. S. S. B.

184. Lighting of the National Gallery.

Anon. El. Times, 87, p. 477, April 4, 1935.

An account, with photographs, of lighting fittings recently installed at the National Gallery. The fittings were designed to overcome the difficulty of lighting glazed pictures. W. R. S.

185. Ohio State Senate Chamber.

Anon. Light, 4, No. 2, pp. 4-5, April, 1935.

Prismatic ceiling plates in conjunction with built-in reflecter units are used in the lighting equipment of the Ohio State Senate Chamber. Over the working area illumination values vary between 15 and 25 foot candles. C. A. M.

186. Theatre Front Lighting.

M. L. Clark, W. C. Brown, F. M. Falge. Light, 4, No. 2, pp. 18-22, April, 1935.

A group of photographs is given indicating present-day practice in theatre front lighting in America. C. A. M.

187. Floodlighting "Orbis Miraculum."

Anon. El. Times, 87, p. 561. April 25, 1935.

An account, with a photograph, of the floodlighting of Westminster Abbey for the Jubilee. W. R. S.

188. Jubilee Floodlighting Schemes.

Anon. Elect., 114, pp. 595-598, May 10, 1935.

A description is given with numerous photographs of various Jubilee floodlighting schemes in London. C. A. M.

189. Floodlighting with Gas.

Gas Journal, May 1, 1935.

A list of the more important places floodlighted by gas during the Jubilee celebrations. (See also Gas Jour., May 1; Gas World, May 4; Gas Times, Apr. 27, May 4, and 11, 1935). J. G. C.

190. New Lighting Features of the 1934 Century of Progress Exposition.

C. M. Cutler. Am. Illum. Eng. Soc., Trans. 30, pp. 255-272, March, 1935.

A paper supplementing that given in Vol. 29, pp. 107-149 (Abstract 79), and describing special lighting installations. G. H. W.

191. Certified Lighting.

Anon. El. World, 105, p. 1122, April 27, 1935.

The article gives some information on shop-lighting standards recommended as good practice by an American electricity supply company. S. S. B.

192. Gas Beacons at the Crystal Palace.

Gas World, May 8, 1935.

Describes the Jubilee display of three large beacons erected at the Crystal Palace, 540 feet above sea level. J. G. C.

Indirect Lighting in Trains and Tramcars

From a paper recently contributed by Mr. R. W. Cost to the American Illuminating Engineering Society (T.I.E.S., April, 1935), it is evident that indirect lighting, which has certain manifest advantages for vehicles, is in favour on many American systems, for example in the latest streamlined trains. The data presented suggests that the illumination is rarely less than about 5 foot-candles, and often considerably more. The chief problem, as one might expect, is the effect of depreciation. In one case, after five months' service, an initial illumination of 6.5 foot-candles had depreciated to only 3.6 foot-candles—a diminution of about 44 per cent.! Merely wiping clean the lamps and reflectors in the coves increased the illumination to 4.5 foot-candles. Accumulations of dust on lamps and fittings and discolouration of the ceiling are the chief factors in causing depreciation, and it is suggested that cleaning should be undertaken every two weeks. Experiments with semi-indirect and "built in" lighting systems will be made as soon as suitable media are available. Traction companies are rather averse to using glass panels owing to fear of breakages and experiments with organic plastics are being made.

Recent Patents

(Abstracts of recent Patents on Illumination & Photometry.)

No. 425,053. "Process for producing a White Luminous Effect in Tubes of Electrified Neon Gas."

de Lamprecht, R., September 6, 1933.

In order to obtain a white light from neon tubes a decolourising gas is added, which is produced by the reaction of sulphuric acid on zinc, the amount of this gas being such that the pressure in the completed tube is substantially that which normally obtains, i.e., from 3 to 12 mm. of mercury. Ether gas may also be added.

No. 425,663. "An Improved Vehicle Lamp."

Lane, J. A., and Lane, A. S., November 21, 1933.

This specification describes a vehicle lamp in which two electric lamp holders are mounted opposite each other at opposite sides of a reflector so that they will take either a single tubular lamp or a pair of bulbs, the holders each being adjustable to vary the distance from the focus of the reflector.

No. 425,653. "Improvements in and Relating to Mountings for Electric Lamps."

The British Thomson-Houston Company, Limited, June 9, 1933 (*Convention, U.S.A.*).

This specification covers a lamp-holder intended particularly for use with focus lamps and reflectors for maintaining the proper register of lamp and reflector. The holder has a flange which is accurately located with respect to the light source and is provided with slots for engaging the locking means of the mirror.

No. 425,694. "Improvements in or Relating to Filaments Supports for Electric Lamps or Like Devices."

John Ismay and Sons, Limited, and Ismay J., September 20, 1933.

According to this specification, in order to reduce the area of contact between a filament and its supports so as to reduce the cooling effect of the supports, the supports each comprise a metal wire formed into a multi-sided loop with straight or curved sides, by one or more of which sides the filament is supported upon substantially point contacts. The loop is preferably triangular with its sides not in the same plane.

No. 425,760. "Improvements in and Relating to Illuminated Signs."

Brackensey, A. H., and The Franco-British Electrical Company, Limited, August 21, 1933.

This specification relates to illuminated signs in which the display matter is cut, etched, sand-blasted, painted, or otherwise produced on transparent material and is illuminated by a neon or other discharge tube. The discharge tube is placed in rear of the glass or other sign panel in register with the sign display matter or in register with grooves comprised in or spaced from the display matter which is arranged upon both surfaces of the sign material so as to give a display both by diffusion and reflection of the light of the discharge tube.

No. 425,879. "Improvements in Incandescence Gas Burners."

South Metropolitan Gas Company, and Prestage, A. J., October 16, 1934.

This specification describes a gas mantle holder adapted to be attached in a gas-tight manner to the burner head by peripherally arranged screws which engage recesses or lugs of the burner head.

No. 426,069. "Improvements in or Relating to Lamp Fittings."

Biggleston, H., The Electric Street Lighting Apparatus Company, and Harrison, H. T., December 4, 1933.

This specification relates to lighting fittings for increasing the illumination from an elongated source in the more distant parts of the area to be lighted. The fitting comprises a canopy supporting an elongated source and concave reflectors, one above the other, opposite to different parts of the source. The reflectors have their focal points at the centre line of the source and are so shaped and arranged that the light from each section of the source will be concentrated and reflected outward and longitudinally in superposed downwardly inclined beams.

No. 426,071. "Improvements in and Relating to Street Lighting Glassware."

Holophane, Limited, and English, S., December 5, 1933.

This specification covers a street lighting refractor for use with a vertical extended source comprising a bowl provided with vertical prisms or flutes on one surface and a band of horizontal prisms on the other surface extending from its upper end downwards to a plane below the horizontal plane through the upper end of the source, the surface being clear of prisms below.

No. 426,205. "Improvements in and Relating to Photo-Electric Cells and the like."

The British Thomson-Houston Company, Limited, September 28, 1932 (*Convention, Germany*).

This specification relates to photo-electric cells of the type in which a semi-conducting film or layer is formed upon a foundation conductor, for example, cuprous oxide on copper or tungsten oxide on tungsten. According to the invention an intermediate layer of metal oxide, between the semi-conducting layer and the counter-electrode, is produced by glow discharge in oxygen and a great increase of sensitivity results. In the case of tungsten oxide cells, silver or nickel oxide produces good results. The intermediate layer may be produced by sputtering upon the semi-conducting layer a thin layer of the metal for formation of the oxide and oxidising by glow discharge in oxygen.

No. 426,592. "Improvements Relating to Flood Lighting Apparatus."

Chance Brothers and Company, Limited, Hampton, W. M., Gough, H., and Holmes, J. G., July 2, 1934.

In order to obtain a single clear shadow bar effect in aerodrome lighting, and for producing similar shadows in other applications, from a battery of light projectors, each lamp has a screen or bar, and the arrangement is such that the shadows cast by each bar or screen merge into a single shadow, and, whilst each bar obstructs a part of the light of its own projector, it offers minimum obstruction to that from other projectors.

"1910-1935: A Retrospect"

THE accession of King George to the Throne followed very closely after the formation of the Illuminating Engineering Society. The inaugural meeting of the Society was held in 1909. It was, however, not until 1910 that its work was in full swing. Looking back on the years 1910-11 one is struck by the number of ideas then originated.

The two chief items in the Society's 1910 programme were the two discussions on "Glare: Its Causes and Effects" (opened by Sir [then Mr.] John Herbert Parsons) and "The Measurement of Light and Illumination." Glare was discussed very fully by the aid of contributions from Continental experts. One cannot escape the feeling that not a very great deal has been added to our knowledge since that date! The other discussion was also a comprehensive one. One idea that seems to have originated about that time was the box integrating photometer. Dr. W. E. Sumpner had worked out the theory and shown that moderate accuracy was quite feasible, and Mr. Lancelot Wild constructed one of the first instruments of this type.

The developments of portable illumination photometers had only just begun. Apart from Mr. Trotter's historic apparatus there was little available. The "lumeter" instrument, first described by J. S. Dow and V. H. Mackinney in 1910 (the original of the "Holophane Lumeter" in its present form), was perhaps the first attempt in this country to make use of the telescope idea, i.e., the inspection through a tube of a separate testplate or distant object.

In 1910 experiments on the central suspension of gas lamps in Cannon-street were going on. Professor Silvanus P. Thompson, the first President of the Society, in that year delivered three lectures on "Illumination, Natural and Artificial" at the Royal Institution. The symbolism of light was illustrated in a play by Maeterlinck then running, "The Blue Bird." In this "Light, the Friend of Man" played a leading part as the constant friend of the two little children throughout all their adventures—in whose presence errors and fears associated with darkness were dispersed.

The subsequent year, 1911, the year of the coronation of King George, was likewise an active one. Reference has been made recently in this journal to the illuminations at the Coronation, which were based mainly on the then familiar method of outlining buildings and objects with lamps. The lighting of the Alleghenny County Soldiers Memorial, described by Mr. Basset Jones in the Transactions of the American Illuminating Engineering Society about this time, in which combinations of incandescent electric lamps with the Moore tube and colour contrasts played an important part, deserves to be recalled as a remarkable instance of early effort towards what is now known as architectural lighting. The Electrical Exhibition held at Olympia in 1911, however, seems to have been remarkable for the very primitive methods of lighting applied to many stalls, the presence of glare being only too evident.

The chief item in the programme of the Society was the discussions on the lighting of schools and libraries, leading to the formation of joint committees which issued reports in 1913 and 1914. Arrangements were also made for the delivery of a series of lectures on illumination at the Polytechnics at Regent-street and Battersea, the Northampton Institute, and University College.

The report of the Departmental Committee on Accidents in Factories and Workshops, issued in this year, contained the final recommendation that a statutory requirement of adequate lighting in general terms should be included in the Factory Acts—a recommendation that has not been fulfilled to this day! This report did, however, lead indirectly to the appointment of the Departmental (Home Office) Committee on Lighting in Factories and Workshops by whom reports were issued in 1915, 1921, and 1922. This step ran parallel with the appointment of a State Committee on the Hygiene of Lighting in France and, in 1913, in Belgium.

Amongst technical advances special interest attaches to the announcement to the Academie des Sciences in France, by M. Claude, of neon tube lighting, and the work of Nutting, who established the points of maximum sensitiveness of the eye in the spectrum for strong light (0.544 μ) and weak light (0.503μ). H. E. Ives estimated that the possible luminous efficiency of light of the former wave length was 65 c.p. per watt. Another noteworthy contribution was that of Butterfield, Haldane, and Trotter, who studied the influence of atmospheric changes on the candlepower of flame standards of light.

Perhaps the most important event of 1911 was the resolution taken at the Turin Electrotechnical Congress to form an International Illumination Commission—a step advocated by Mr. L. Gaster, on behalf of the Illuminating Engineering Society of London, which was thus largely responsible for the initiation of this new body. During 1912 the constitution of the Commission was determined at a special meeting held in Berlin. (It is interesting to observe that it was originally contemplated that the Illuminating Engineering Societies of the various countries, where they existed, should act as national committees.

Other events in 1912 were the introduction of drawn-wire filaments for electric lamps, the formation of the German Illuminating Engineering Society, and the proposal to instal electric light in the House of Commons. It is curious to recall that Mr. E. Treacher Collins, in a report on this subject, was careful to detail the steps proposed in order to eliminate any possible danger from ultra-violet rays; and that he stated that the existing illumination in the House, about 4-5ths of a foot-candle, could be readily furnished by the new system!

The year 1913 was noteworthy as marking the centenary of gas lighting, which was celebrated by an exhibition held at the White City. In 1914 the chief technical event was the introduction of the gas-filled (or, as it was then termed, the "half-watt") lamp, which, however, like all other developments, was checked by the outbreak of the Great War.

In the subsequent years little progress in illuminating engineering could occur, though the Illuminating Engineering Society did succeed in keeping its work alive and in holding fairly regular meetings. One of the few advances directly attributable to war conditions was the formation of the Department of Scientific and Industrial Research, and its Illuminating Research Committee, which is still functioning to-day.

The period following the war was one of considerable activity, until, in 1928, the Society suffered the loss of its founder, Mr. Leon Gaster. In the subsequent years, however, good progress has been made, as exemplified by the Society becoming an incorporated body in 1930, and by the holding of the International Illuminating Congress in this country in 1931. In the technical field the most important advances, probably, have been the introduction of the electric discharge lamps, first described before the Society in 1932, and the new methods generally described as "architectural lighting," which have made great progress during recent years.

Floodlighting for the Silver Jubilee

by PERCY GOOD

(Honorary Treasurer of the Illuminating Engineering Society).

THE plans for celebrating His Majesty's Silver Jubilee, the outstanding event of the past month, would have been incomplete without floodlighting. Light being the symbol of life and happiness, sun-lit days and brightly illuminated nights are the fitting accompaniments of a great public rejoicing. Happily the sun rose nobly to the occasion and London was favoured by a day of glorious brilliance. At nightfall his task was taken over by the illuminating engineers, whose floodlighting efforts attracted crowds even greater than those that filled the streets in 1931.

The expressions "floodlighting" and "floodlit" may be in some degree unfortunate ones. "Bathed in sunlight" or moonlight would be the corresponding descriptions in the case of lighting by the direct rays of the sun or moon. But the expressions have become so embedded in the language of the past few years that a change is unlikely, unless some very happy alternatives can be found.

A Fine Display

The display in London has been on an unprecedented scale. In the neighbourhood of Buckingham Palace could be seen also St. James's Palace, the Admiralty Arch, Westminster Abbey, the Horse Guards Parade, the Queen Victoria Memorial, the flower beds and lake-side in St. James's Park, Big Ben, the National Gallery, the United Services Museum, the War Office, and the Temple illuminated. In Trafalgar Square, Canada and South Africa paid their tribute by lighting their own buildings, and, further afield, the dome of St. Paul's Cathedral stood out against the night sky. Hampton Court Palace and the fountains, as well as that other Royal Palace, the Tower of London, presented spectacles of great beauty. On the river-side the County Hall and H.M.S. President were pictures in light. The London Passenger Transport building again served as a token, visible across the Royal parks, of progressive London. In the City Mansion House, Royal Exchange, Bank of England, Port of London Authority, as well as some of the famous City churches, were illuminated, the Royal Exchange venturing into colour.

The local authorities and great business houses responded to the appeal, Marylebone Town Hall, Adelaide House, Selfridges, and others too numerous to mention.

Not only London, but the provincial cities. also offered such a display as must definitely set a new standard in the use of artificial light. In all between 500 and 600 buildings have been floodlighted throughout the country.

Floodlighting in 1931

The first real introduction of the British Public to floodlighting on an impressive scale was in 1931 for the International Illumination Congress, in the organisation of which the Illuminating Engineering Society took a leading part. There had been decorative floodlighting at Exhibitions and in isolated cases, but until most of the famous buildings were lighted on that occasion the majority of the general public was not really conscious of the fact that a new æsthetic pleasure had become available for their benefit.

In 1931 the installations were carried out in a temporary manner by the makers of the equipment and the contractors jointly. All this work was done gratuitously. On the present occasion, as a result of efforts made under the auspices of the London Society, permission was secured to present to H.M. Office of Works permanent installations for Buckingham Palace, the Horse Guards Parade, Big Ben and the National Gallery. The Electrical Industry in London has generously provided, through the Electrical Development Association, the necessary funds for this purpose. The Governors of the Gas Light and Coke Company are not behind their electrical friends in generosity, for they have laid permanent gas mains in St. James's Park. The installation at St. Paul's Cathedral has also been made permanent, and the money required is being provided by the Corporation and a number of other City interests.

In 1931 each particular installation was carried out in the manner decided upon by those who leased the equipment, and the temporary character influenced the results. On this occasion the whole of the work on the Government buildings, both permanent and temporary, and that on a number of others, such as Westminster Abbey and the Hall of the Incorporated Accountants, was carried out under the direct personal advice and guidance of Mr. Hubert Baines, the Chief Engineer of H.M. Office of Works, an arrangement which greatly contributed to the beauty and interest of this Jubilee display. It must be remembered, also, that during the interval since 1931 there has been much technical and scientific progress in the production and projection of the light, both in the electrical and gas industries, and the technique of floodlighting has been studied intensively. Important papers before the Illuminating Engineering Society have led to a greater understanding of the subject and to close co-operation between the architect and the lighting engineer.

In addition the planning of the details of these floodlighting installations has rested very largely in the hands of members of the Illuminating Engineering Society. The Society, therefore, can take pride in the fact that it has made a substantial contribution to the success of this unique display.

The Justification of Floodlighting

Now that the public has had this opportunity of witnessing a display on such a considerable scale, the opportunity may be taken to review the whole question of the floodlighting of buildings, the expediency of which has sometimes been questioned on aesthetic or economic grounds.

The lighting of buildings of character can be defended on the grounds that they are made more visible in every sense of the word. In the daytime a building is generally just part of a group; traffic disturbance and business prevent any real opportunity for the appreciation of its beauties. When such a building is located in a city the time available and the opportunities for seeing it in comfort are greatly increased if it is made visible at night. A building then stands out as an isolated picture and not, as is so frequently the case, as part of a jumble of buildings. The educational advantages to be gained from such added opportunities for seeing buildings are by no means unimportant. It can confidently be asserted that comparatively few city people realised the architectural value and beauty of the spire of Bow Church until they saw it floodlit; in fact, few realised that it

existed, for Cheapside in the daytime is no place in which to loiter, however beautiful the picture.

Undoubtedly an essential factor in any attempt to justify the floodlighting of public buildings is the cost.

Generally considerable expense is incurred in providing a pleasing façade to an important building, and a small percentage added to the cost is sufficient to provide for at least double the normal view of the picture, and would seem to be a reasonable expenditure.

The only question upon which opinions still differ widely is as to whether the floodlighting of these buildings can be justified artistically.

Natural and Artificial Lighting Compared

The chief objection raised to floodlighting is that the artificial light reaches the building from an angle very different from that for which the mouldings, etc., had been designed, and that an inartistic effect is therefore inevitable. As, however, daylight reaches it from almost every angle from horizontal to vertical, and is often only present as diffused light, there can be but little in this argument. Further, the greatest use of mouldings is for inside work, where the architect generally uses the same shaped mouldings for positions which must be lighted in opposite directions; yet no one has urged that the design of a picture-frame or wood-panel is wrong because the top moulding is lighted the opposite way to the bottom one. The design of mouldings on the outside of a building would seem to be related more to convention or weathering properties, or to the fact that they are seen from below, than to the fact that they are lighted from above.

There should really be no attempt at a direct comparison between the picture produced by the building by day and the floodlit scene. To light a building at night from above to imitate the direction of the sun's rays at midday would in many cases produce a result far from pleasing. The fact that the object is being viewed with a dark mount and frame, isolated from its neighbours, requires that it be lighted to conform with the conditions which would normally produce that result. The effects of floodlighting should not be an attempt to imitate the sun with blinkers on. It must therefore be considered entirely on the merits of the result it produces.

The appearance of any object is due solely to the light it reflects. It is by the direction, relative quantity and colour of the reflected light that every effect, whether of shape, texture or colour, is produced. The architect achieves a beautiful façade by the skilful utilisation of proportion, shape, and surface characteristics. Experience has taught him what to do and what not to do.

In the case of buildings not designed with a view to possible floodlighting, it is necessary for the lighting engineer to provide light sources so located that the effect produced impresses the onlooker with the character, main features or certain details of the building.

In designing a new building it is necessary for the architect to consider the greatly added possibilities now available by the use of modern lighting equipment externally.

Some artists portray a subject in every detail with an infinity of patience and skill; on the other hand in some great pictures the result is secured by a stroke here or a mass effect there. So the lighting expert can and does produce an effective presentation of the architect's conception without attempting to imitate the effect produced by daylight. Where the night picture demands a sense of mystery it can be produced; where it demands sharp contrasts or brilliant effects, these can also be obtained.

The picture obtained by floodlighting a building is, in fact, one quite unrelated to the daylight picture, and must be so judged. If the lighting has produced a satisfactory impression of the purpose of the building, its proportions, its ornamentation, or if it has produced a pleasing rhythm, or sense of completeness, the effort surely could be said to be justified on artistic grounds.

The examples on exhibition in connection with the Jubilee should demonstrate to most people that all these conditions can be satisfied.

It is perhaps almost a question as to whether nature is as artistic as floodlighting. There is certainly always something very beautiful when objects are lighted by the sun low in the heavens, and it is this effect somewhat amplified, that floodlighting generally produces. Any doubts on the subject would have been set at rest by the sight of the outside of King Henry VII.'s Chapel from Palace Yard when floodlit, while the interior picture of the renovated ceiling of the Chapel floodlit from outside was one of fairylike beauty.

The lighting of public gardens, with which effects of great beauty are produced, has not met with the criticism which the lighting of public buildings has had to face, and needs no defence. St. James's Park was a great joy and attracted the eulogies of the multitude.

Colour Effects

The modern development of the gaseous electric lamp has provided an economical means of producing coloured light in large quantities which, while it cannot yet be projected as well as the white light from the metal filament lamp, is suitable for projection to a reasonable extent

Those who crave for a more colourful life may perhaps welcome this development, four important examples of which were furnished by the Horse Guards Parade, the County Hall, the Middlesex Guildhall, and Hampton Court Palace.

The use of colour on such buildings is, to a large extent, a new venture, and one likely to meet with criticism.

There can be no doubt that for some types of festival a colour effect on almost any building may be justified, but for most occasions the destruction of the much-beloved white and black of Portland stone seems almost like destroying London itself.

It is hoped that those who love colour will be satisfied with coloured advertisements in appropriate places, without using coloured light permanently on such beautiful examples of black and white as the Horse Guards building.

The projection of coloured light on buildings which, by virtue of their design, age, or association, are of real significance is, in the writer's opinion, inexpedient. It has to be remembered that the whole appearance of anything we see—all that we call its character—is impressed on the consciousness by the light which is reflected. White light, as generally understood, consists of a very wide band of vibrations, each producing its own colour effect. When we project the whole range of the spectrum, and even vibrations beyond the spectrum, on to a building we are giving it the opportunity to reflect its character and individuality by selection of just those wave-lengths which suit the purpose. When you limit the band of wave-lengths projected on the building, the risk is run that the building can no longer reflect its own individuality. Such imposition of the opinion of the engineer may be suitable for purposes which perhaps can be described as theatrical—that is, to produce a false impression. Take, for example, the Horse Guards Parade. "The Times," in a eulogistic article in the true Jubilee spirit, said:—

> "And eastward past the trees and their shadows stands a magic castle of palest violet, which some wizard has put where the Horse Guards used to be."

This is, in effect, a condemnation. The view from the bridge in St. James's Park, which was obtained in 1931 with white light on the Horse Guards Parade, and on a portion of the Foreign Office, presented a picture not only in complete keeping with the

character of the place, but one of superb beauty. This time we had a greenish-bluish building, which any onlooker would assume was made of papier mache or plaster, simply as a temporary structure for an exhibition. It was no longer a part of London; no longer was it the world-famous view.

Hampton Court and St. James's Palace fared somewhat better. St. James's Palace, being of brick, holds the grime in a way the stone buildings do not, and it was probably a matter of but little importance whether a little colour was used. It would be extremely interesting to know the relative widths of the band of the spectrum which the screens used on St. James's Palace had in comparison with the widths of the band of the coloured lights at Hampton Court Palace. Sunsets are sometimes beautiful in their gorgeousness and tint everything with golden red, but is not this only satisfactory as a fleeting impression? It may be, however, that some colour to the artificial white light is useful in certain cases. The artificial white light may be deficient in some desirable characteristics, and perhaps, for example, the addition of blue or red may be valuable. This is perhaps why Hampton Court and St. James's Palace fared better and were not so artificial as the Horse Guards Parade. In both those cases it is possible that white with some red added would produce the most satisfactory result, and usefully amplify certain of the characteristics of these buildings.

Permanent Installations

Following the efforts made during the past two years, as mentioned above, the electrical industry have shouldered the burden of providing permanent installations at Buckingham Palace, the Horse Guards Parade, the National Gallery, and Big Ben, and other interests have shouldered the burden of the cost of St. Paul's Cathedral. (Further contributions towards this are still desired, as the total amount has not yet been received.) The thanks of all are due to those who have so generously contributed to this end, and also thanks are due to Mr. Baines and his staff for their work in connection with these installations.

The provision of permanent installations means that the wiring is all carried out on a permanent basis with simple means for connecting the projectors when required. Normally, the projectors and lamps would be removed and put into store until required again. The cost of current is a very small amount, probably not more than £3 per hour for the five buildings which have been permanently wired.

There are, however, one or two of the installations which deserve special consideration. It is not generally realised that London has a greater number of beautiful vistas than most capital cities. The view from the bridge over the lake in St. James's Park has, perhaps, no equal, and the public might well demand, and pay for, the lighting of the Horse Guards building on Saturday and Sunday nights throughout the year provided the permanent lamps are white.

King Henry VII.'s Chapel should also, without any shadow of doubt, be fitted with a permanent installation.

No one to-day considers money other than well spent on the flowerbeds, lawns, and bands in the London Parks. The expense of floodlighting would be trifling, and a little money spent on the lighting of such beauty spots should be considered as an essential public service.

There is, moreover, one building which should never be without floodlighting. St. Paul's is a great landmark in more ways than one, and if the public would provide the means, and the Dean and Chapter would grant permission for the every-night use of floodlighting, an unfailing source of inspiration, and a nightly opportunity to look upwards to the symbol which surmounts the Dome, would be given to Londoners and visitors.

The need for encouraging an ever-growing civic sense calls urgently for the County Hall in London and the Town Halls throughout the country to make frequent use of this method of reminding the citizens of their privileges and duties.

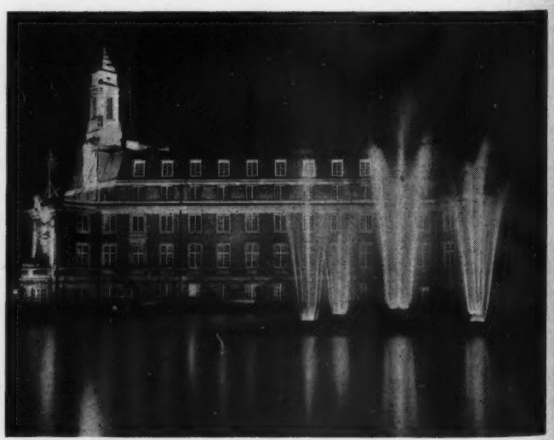
The Future of Floodlighting

London is being rebuilt, and when any important building is to be erected there can now be no excuse for failing to design it for both day and night lighting.

Is not the time coming when the blatant commercial shriek will be suppressed and appropriate lighting effects will be supplied by the people for their own enjoyment? The South Bank of the River, so soon to be developed, calls for special attention in this respect. Complete control and exclusion of advertisements, with insistence on appropriate lighting of many of the riverside fronts of buildings yet to be erected there, is surely a responsibility which the authorities must shoulder.

(This article is an extension of the original contribution by Mr. Percy Good which, in an abbreviated form, appeared in the "Morning Post," May 1, and the "Daily Telegraph," May 3.)

St. John's Church and Gardens, Hackney, Illuminated by B.T.H. Floodlight Projectors.



A View of the Metropolitan Water Board Headquarters in Rosebery Avenue, London, Illuminated by G.E.C. Floodlights.

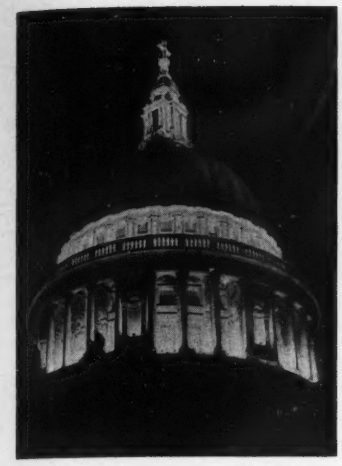


Fig. 1. A view of St. Paul's showing the effective display of pillars silhouetted against a bright background.

The Silver Jubilee Floodlighting

Notes on Outstanding Installations, chiefly in the London Area.

Fig. 2. A more distant view of St. Paul's showing how supplementary floodlights illuminated the dome and cross.

In attempting a description of the Silver Jubilee floodlighting it is difficult to know where to start. The installations here pictured are mainly those in London, of which particulars were most readily available and which naturally formed the centre of interest. But it should be understood that there were many displays in all the large cities, and many other installations of distinction.

St. Paul's.

In London it may be well to take as a start the floodlighting of the two great national churches, St. Paul's and Westminster Abbey. For the former, which is illustrated in Figs. 1 and 2, the General Electric Co., Ltd., and Messrs. Siemens Electric Lamps and Supplies, Ltd., were jointly responsible. Batteries of projectors equipped with 1,000-watt lamps were mounted behind the columns of the colonnade and the balustrade of the stone gallery. The pillars stand out silhouetted against a light background. The ball and cross and the tower supporting them were illuminated with narrow beam floodlights placed on the East and West corners of the roof. Altogether ninety-three floodlights were used on this scheme, which enabled many architectural features, for many years indistinguishable even in bright sunlight, to be examined.

Westminster Abbey.

The floodlighting of Westminster Abbey, for which Holophane, Ltd., were responsible, also presented in-

Fig. 3. Westminster Abbey. A fine view taken from the top of the Central Hall, Westminster.

Fig. 4. Westminster Abbey; North Entrance and Rose Window floodlighted by long range projectors.

teresting features. The wishes of the Abbey Authorities demanded a graceful and restrained effect, involving only a moderate degree of brightness. The West Towers of the Abbey were lighted from the flat roof of the adjacent Central Hall (immediately opposite) by twelve 1,000-watt long-range projectors. By utilising eight similar units mounted on the corner roof of Westminster Hospital, the rays of which were inclined at approximately 30° to the face of the West Towers, the impression of "flatness" was successfully eliminated. (See Fig 3.) For the North elevation facing Parliament-square treatment was concentrated on the upper and relatively light portion of the face. 500-w. wide angle units were applied from positions enabling the flying buttresses to be picked out in a manner impossible from the ground. For the dark part of the elevation a different device was adopted—namely, to illuminate the stained glass windows. The darkness of the walls served to enhance the fine effect, which is illustrated in Fig. 6.

The North Main Entrance was treated by distinct banks of floodlights which illuminated the front elevation and the famous rose window. King Henry the Seventh Chapel (Fig. 7),which has recently been restored. forms the East End. For this floodlights in a special box formation, painted green to match the grass plot on which they were set, were used. The ornate character of the architecture and the light colour of the newly restored fabric contributed to the interest of this display. The total lighting load for the Abbey and Chapel was 85 kw. In all about 12,000 yards of cable and 175 1,000-watt floodlighting projectors were used.

Fig. 5. A striking view of "Big Ben," an outstanding landmark.

"Big Ben."

Big Ben (Fig. 5), floodlighted by Messrs. Siemens Electric Lamps and Supplies, Ltd., on all four sides, was naturally an outstanding feature in Westminster. For this purpose 120 1,000-watt projectors were used, thirty-six on each side of the East and West faces and twenty-four on each of the North and South faces; the former being mounted at ground level and the latter on the roof of St. Stephen's Club and on the adjacent roof of the House of Commons. The longest throw was 370 feet and the shortest 120 feet. The dark colour of the roof above the clock needed special treatment, so that a third of the available projectors (forty) were concentrated on this portion. Vertical spreading glasses were fixed on certain of the projectors in order to soften the beams and overcome any tendency towards "patchiness."

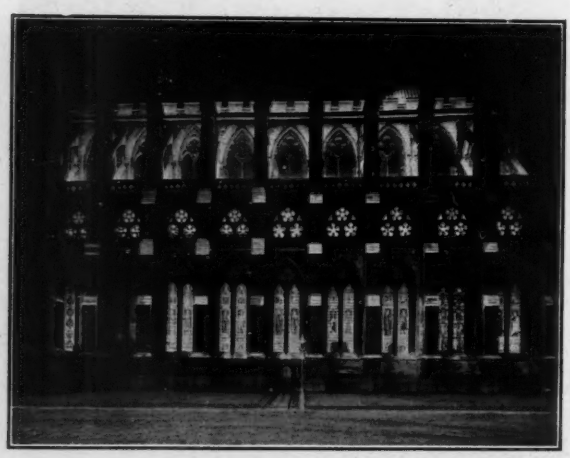


Fig. 6. Interior Floodlighting of the stained glass windows of Westminster Abbey, a unique and distinctive effect.

Fig. 7. King Henry the Seventh Chapel, Westminster Abbey; the ornate architectural features of this building demanded special care in arranging the lights.

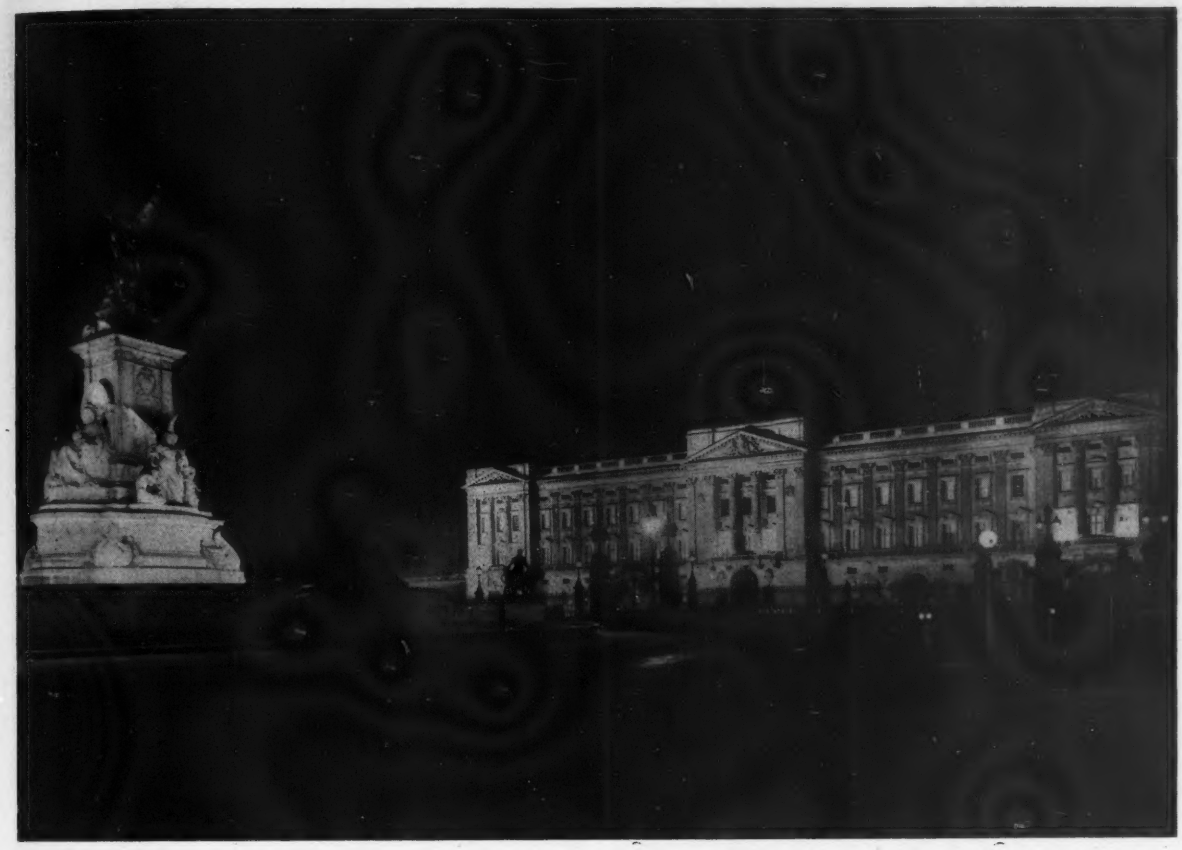


Fig. 8. Buckingham Palace and the Victoria Memorial where vast crowds assembled every night during Jubilee Week.

Buckingham Palace and the Victoria Memorial.

The floodlighting of Buckingham Palace (Fig. 8) on this occasion was done with great care, and the scheme of lighting, involving five distinct batteries of projectors specially selected and applied, was of some complexity. One extra feature, as compared with 1931, was the installation of local lighting for the area behind the columns of the two side and centre balconies. Other devices were used to accentuate contrast between the recessed and projecting parts of the building. Undoubtedly the effect of these new methods was to give more "life" to the building as a whole so that experience gained in 1931 was applied with advantage. The total number of floodlights used by the General Electric Co., Ltd., on this installation was 133, and the total load 127 kw. The Victoria memorial (also a G.E.C. installation), which is seen on the left of the picture, was illuminated by floodlights equipped with amber colour-screens.

The Horse Guards (Fig 9) and St. James's Palace (Fig. 10) furnished examples of floodlighting with coloured light. For the Parade frontage of the former, for which the British Thomson Houston Co., Ltd., were responsible, fifty-two Mazda Mercra lamps in projectors fitted with special blue colour-screens were used, whilst the Whitehall facade and tower was lighted by fifty 1,000-watt units giving white light.

For St. James's Palace Messrs. Siemens Electric Lamps and Supplies, Ltd., applied fourteen 500-watt asymmetric floodlights and two medium angle 500-watt floodlights, whilst the Clock was illuminated by

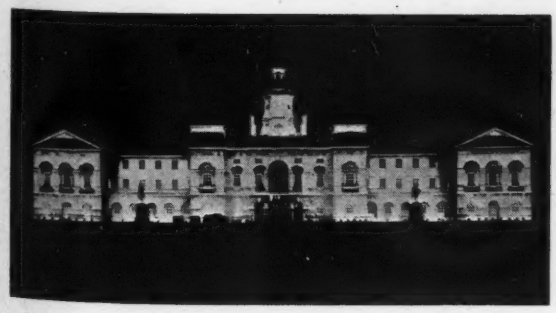


Fig. 9. The Horse Guards floodlighted by 52 discharge lamps equipped with special blue colour screens.

Fig. 10. St. James's Palace floodlighted in amber by asymmetric floodlights equipped with 1,000-watt lamps.

Fig. 11. A view in St. James's Park where the floodlighting, by gas, of the lake and flower beds attracted dense crowds of sightseers.

three narrow beam projectors of 1,000 watts each. This installation was carried out with amber colour-screens, and thus, like the Victoria Memorial, the Horse Guards, Westminster Hospital, and some other installations in the vicinity, presented a distinct contrast with the prevailing white light.

The adjacent illustration (Fig. 11) shows an enchanting view of St. James's Park, which was floodlighted by approximately 300 gas lamps, and again proved a great attraction. On this occasion the arrangements were on an even greater scale than in 1931, about four miles of gas piping being used. The projectors did their work well, and the variety of positions assigned to them (some were mounted in the lake itself) was a tribute to the flexibility of modern gas lighting. The illumination of the beds of flowering tulips was much admired, but the lighting of the foliage on the islands, well illustrated in Fig. 11, was perhaps one of the most successful items. The great difficulty in the treatment of this large area—of achieving the illumination of objects to be seen from so many different viewpoints without the direct light from projectors coming into the field of vision—was surprisingly well met. One of the most pleasing glimpses was the illuminated "dell," north of the lake, near the Guards' Memorial—a point where the crowd was apt to become especially dense at times!

The Admiralty Arch (Fig. 12), which was illuminated by 77 1,000-watt lamps in B.T.H. projectors, formed a fitting entrance to the park. Four main banks of projectors were assembled on adjacent buildings, others at the base of the Arch.

Fig. 12. The Admiralty Arch, which forms a fitting gateway to St. James's Park.

Fig. 13. The National Gallery, floodlighted by 45 projectors equipped with 1,500-watt lamps.

Proceeding from the Park into Trafalgar-square, we find the installation for the National Gallery (Fig. 13), which was carried out with forty-three 1,500-watt Ediswan "Saturn" floodlanterns and two "Juno" lanterns of similar capacity.

The Athenaeum Club (Pall Mall) was treated with G.E.C. floodlights. This is interesting as a case of silhouette effect in which the pillars were allowed to stand out against the bright background.

Some Riverside Views.

On the Embankment many striking installations were to be seen. Below will be found a fine view of the London County Hall, which, illuminated by the pale green light of Mazda Mercra electric discharge lamps, was a striking spectacle from Westminster Bridge. This installation comprised eighty units, twenty-four of which are to be permanently allotted to illuminate the centre of the building.

Closely adjacent to the installation last mentioned was the new parapet lighting with Osira electric discharge lamps along the Thames Embankment on the south side of the river, for which the General Electric Co., Ltd., were responsible. Whilst not a floodlighting effect, this new installation, opened on Jubilee Day, is of considerable interest. (Figs. 16 and 17.)

Other river views are shown in Figs. 18, 19, and 20. The lighting of the Hall of the Incorporated Society of Accountants (Fig. 18), for which Siemens Electric Lamps and Supplies, Ltd., were responsible, is an example of restraint. Five 1,000-watt medium-angle floodlights sufficed for the front of the building, and two asymetric units of similar capacity for

Fig. 14. The Athenæum Club—an example of Silhouette Effect.

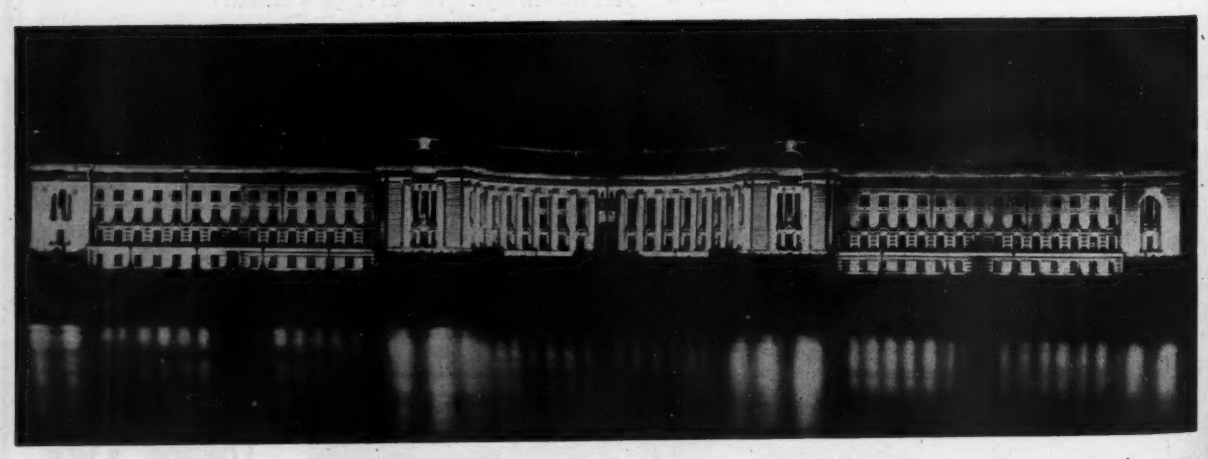


Fig. 15. The London County Council Building, illuminated by electric discharge lamps, a striking spectacle seen from across the river.

Fig. 16. A view of the new parapet lighting by electric discharge lamps on the Thames Embankment, with the I.C.I. Building visible across the river.

Fig. 17. Another view, taken from Lambeth Pier, with St. Thomas's Hospital in the distance.

the sides. These projectors were equipped with daylight-blue screens, giving a definite but not too pronounced contrast with the ordinary white lighting provided by narrow beam projectors for the flags and golden ship weathervane.

Another Siemens installation of interest was the Tower Bridge (Fig. 19), for which sixteen narrow beam and eight medium angle floodlights were used.

Other outstanding riverside installations were those for the I.C.I. Building, Thames House, and Shell Mex buildings, all situated on the north side of the river. In all these cases the nature and position of the building favoured local lighting, so that a fair amount of contrast was exhibited. In Fig. 20 a fine view of the I.C.I. installation, for which the General Electric Co., Ltd., was responsible, is seen.

The illumination of the Clock Tower of Shell-Mex House has been, of course, a familiar spectacle to Londoners, but the whole of the Embankment façade was illuminated for the Jubilee by means of twenty Ediswan "Mars" projectors, equipped with 1,000-watt lamps, and mounted in banks of five on platforms by the Embankment Gardens. Five similar projectors were used at the ends of the building for "feature-lighting" of the corners. Two alcoves on the Embankment side and one each on the east and west of the building were accentuated by high-intensity lighting, five 500-watt projectors being allotted to each alcove. Two set-backs below the Tower were also lighted, giving a total of eighty floodlights in addition to those originally installed for the Tower.

Fig. 18. The Hall of the Incorporated Society of Accountants.

Fig. 19. The Tower Bridge, illuminated by 16 narrow beam projectors and 8 medium angle floodlights (24 kw.).

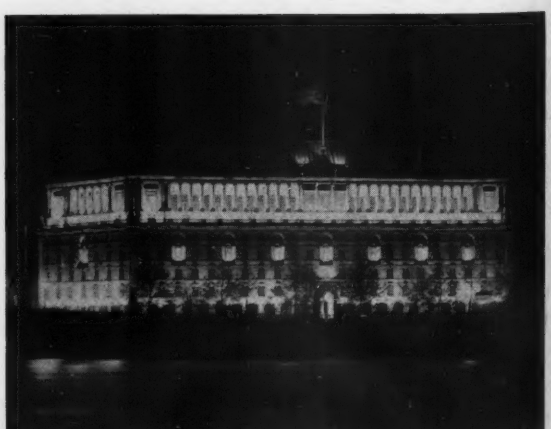


Fig. 20. Imperial Chemical House on the Embankment, viewed from across the river.

Fig. 21. The Shell-Mex Building on the Embankment.

Fig. 22. Floodlighting of the Figure of Justice outside the Central Criminal Court (Old Bailey).

Some Other London Installations.

Amongst other London installations, mention may be made of the illumination by Siemens and English Electric Lamps, Ltd., of the figure of Justice outside the Central Criminal Court (Old Bailey), an example of lighting by means of narrow-beam projectors set in three positions; the G.E.C. floodlighting of Broadcasting House (Fig. 23), with special treatment of the pylons and flagstaff; and the lighting by the British Thomson-Houston Co., Ltd., of India House, which was interesting as a combination of floodlighting with the use of coloured luminous tube lamps, about 100 yards of which were used to form the main theme.

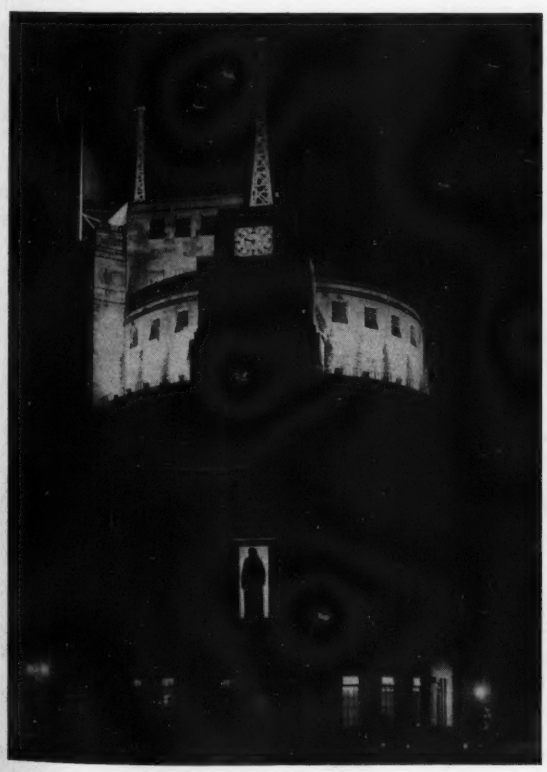


Fig. 23. Broadcasting House, an unusual piece of Floodlighting.

Fig. 24. India House, where floodlighting was combined with the use of coloured tubular lamps.

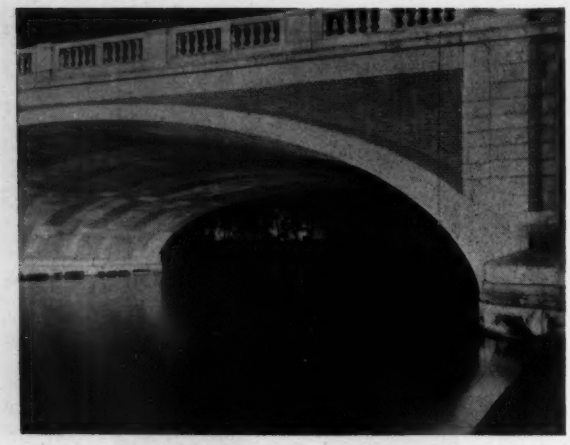


Fig. 25. A charming view, through Hampton Court Bridge, of the Palace illuminated by Osira (red beam) colour floodlights.

Fig 26, The Mansion House, illuminated by five Siemens assymetric floodlights equipped with 1000-watt lamps, placed on the portico.

The views on this page include a pleasing aspect of Hampton Court Palace (Fig. 25) illuminated by Osira (G.E.C.) floodlights yielding rose-coloured light. The Bank of England (Fig. 27) and the Mansion House (Fig. 26) were both arranged by Messrs. Siemens Electric Lamps and Supplies, Ltd.

We also present below two illustrations of installations for which Kandem Electrical Co., Ltd., were responsible. The photograph of the entrance to Lloyds, taken at the moment when H.R.H. the Prince of Wales arrived at the reception given to the Dominion and Overseas visitors, is of special interest.

We are giving, in conclusion, pictures of a few installations from other parts of the country. Some of these appear on the opposite page. Figs. 30 and 32 are of two effective gas lighting installations, and Fig. 31 shows

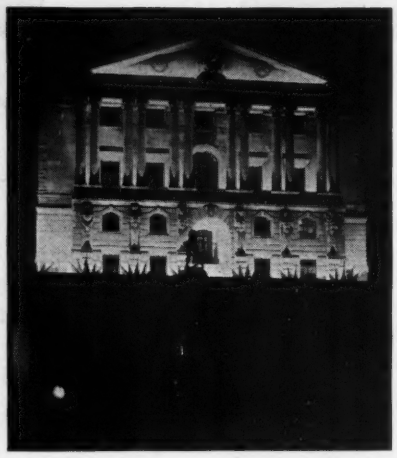


Fig. 27. The Bank of England, another Siemens installation, with a total load of 15½ kw.

the spire of Salisbury Cathedral —the very highest in the country — which was floodlighted under the supervision of Mr. Stanley Earnshaw of the Strand Electric Company, in conjunction with Mr. C. E. Walters of the Salisbury Supply Company. The even illumination of this very high spire was effected by the use of special types of Strand projectors designed to furnish a concentrated beam for a long throw. Similar units were used to floodlight the Guildhall and the Power Station at Salisbury.

The Strand Electric and Engineering Co., Ltd., have also been concerned with numerous installations in London (such as the Ritz and Langham Hotels, Grosvenor House, Islington Town Hall, etc.). We understand that they are furnishing the whole of the lighting for the Tower Pageant and Tattoo which is now being performed. In this installation ninety projectors, operating on the three-colour system, are erected on the front edge of the stand, and eighty-six directional signs are being used.

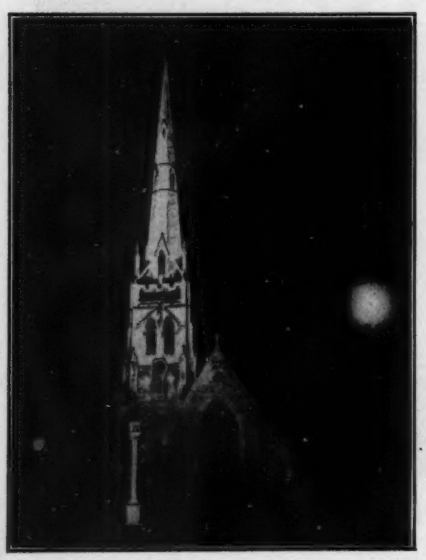


Fig. 28. *On the left.* Christ Church, Lancaster Gate, London. The tower and spire (280 ft. high) were illuminated by Kandem long range projectors, about 100 ft. away, the lower parts of the church by wide angle projectors.
Total Load 12 kw.

Fig. 29. *On the right.* The Entrance to Lloyds, illuminated by Kandem narrow beam projectors mounted 2 ft. from the base of the columns and fitted with cowls to prevent the light source being visible to those entering and leaving the building.

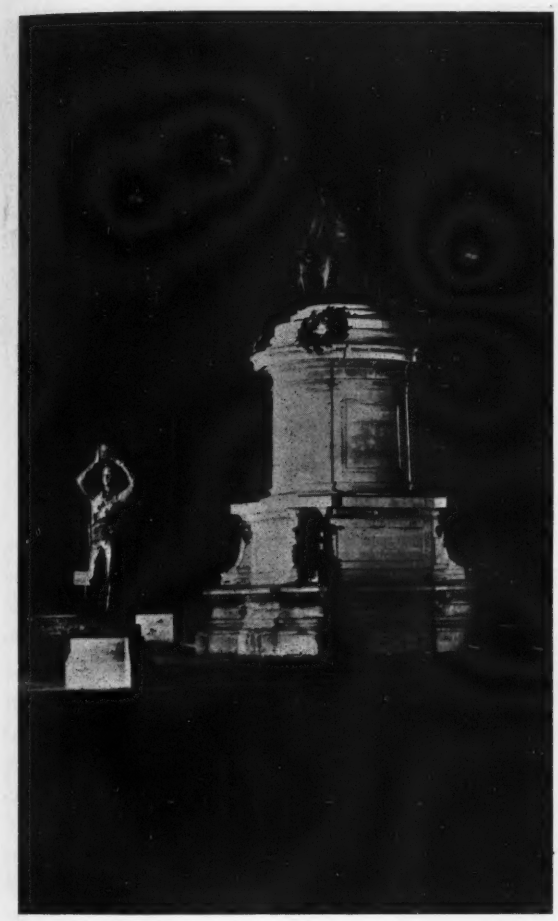


Fig. 30. The Gower Monument to Shakespeare at Stratford-on-Avon, floodlighted by two 10-mantle parabolic Gas Lamps.

Fig. 31. The Spire of Salisbury Cathedral illuminated by 32 Strand Electric 1000-watt floodlights. (The spire is 415 ft. high.)

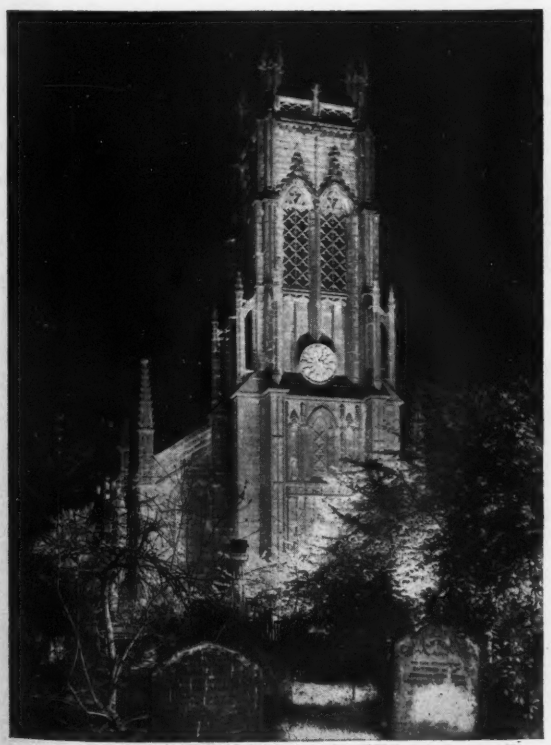


Fig. 32. The Parish Church, West Bromwich, floodlighted by Parkinson Gas Lamps.

Fig. 33. The Memorial, Council House Clock Tower, and a fountain in Chamberlain Square, Birmingham, illuminated by G.E.C. projectors.

Fig. 35. St. Albans Town Hall.

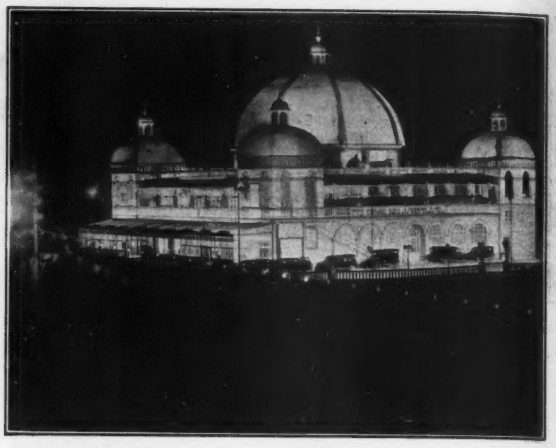


Fig. 36. Three-Colour Floodlighting of the Rhyl Pavilion.

Our last illustrations (a few selected from the many sent to us from different parts of the country) are typical of what was done in many places outside London. The floodlighting of St. Albans Town Hall (Fig. 35) by Holophane 1,000-watt and 750-watt projectors was evidently an effective piece of work. Holophane, Ltd., were also responsible for some unusual spectacular colour-lighting on the Rhyl Pavilion (Fig. 36), which was done in three colours by the stage lighting department of the company.

We are indebted to Messrs. Falk Stadelmann and Co., Ltd., for a number of pictures of installations carried out by them at Bromley, Kent. The illumination of the needle of the War Memorial (Fig. 37) was effected by three 500-watt Hampton floodlight units of the mirror type. For the base four box projectors, equipped with green colour screens, were installed and the contrast with the illuminated needle above was most effective. The illumination of the bandstand, lake, and trees by six Malvern floodlight units is seen in Fig. 38. Watertight units were installed at the base of the bandstand, and effective use of strip lighting was made above.

Fig. 37. The War Memorial, Bromley, Kent, an effective two-colour installation.

The final illustration (Fig. 39) shows the floodlighting with gas of the Pump Room at Leamington, which made special efforts to celebrate the Silver Jubilee in a fitting manner. The Priors Gas Co., through its manager, Mr. R. S. Ramsden, undertook the above installation and also the lighting of the waterfall at the Mill Bridge and the old Hitchman fountain, brought again into use for the occasion.

In our next issue we may be giving particulars of some other installations. The general electric load for floodlighting was in the neighbourhood of 50,000 kw. The cost of this vast demonstration has been met almost entirely by the lighting industry.

Fig. 38. The Bandstand, Lake and Trees at Bromley, Kent.

Fig. 39. The Leamington Spa Pump Room, floodlighted by gas.

Show Window Lighting Equipment

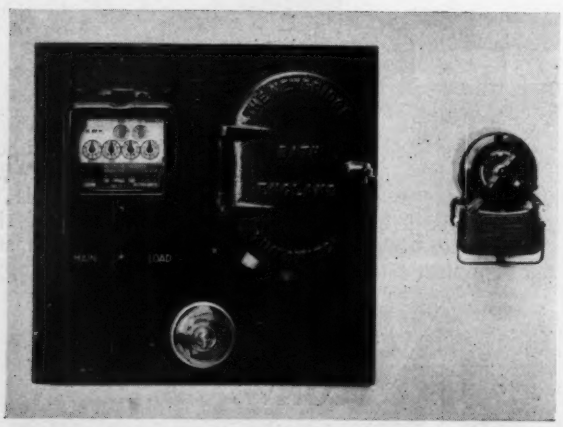
A useful catalogue recently issued by Siemens Electric Lamps and Supplies, Ltd., shows how varied the equipment for lighting shop windows has become. In addition to reflectors for various types of windows there are spotlights with colour screen attachments, Linolite strip reflectors, and a great variety of illuminated signs of the descriptive type which serve both to indicate the contents of a window and to screen lamps which illuminate the exhibits.

Philips "Philora" Sodium Lamps

We learn that 150-watt lamps of the above type in special Wardle "Solux" flood fittings are to illuminate the Highcliffe Hotel, Bournemouth, during the period of the Convention. Similar lamps in special fittings are to be used to light Richmond Hill, and other fittings designed for the use with "Philora" lamps by Holophane, Ltd., and Revo Electric, Ltd., will also be on view.

New Types of Time Switches

We understand that the Horstmann Gear Co., Ltd., is arranging an exceptionally complete range of electric time switches, applicable to street lighting and shop and sign lighting, at the National Electrical Convention, which is about to be opened in Bournemouth. A detailed display of the solar dial, shown below, with which any desired lighting or extinguishing schedule can be followed, will be provided. A model specially designed for the control of street refuge lighting and an entirely new time switch for low rate window lighting will also be included. The latter, which is also illustrated below, enables window lights to be switched on and off during the day by a tumbler switch. In the evening the time switch changes over to the low rate and, at an agreed hour, switches the window lights off.

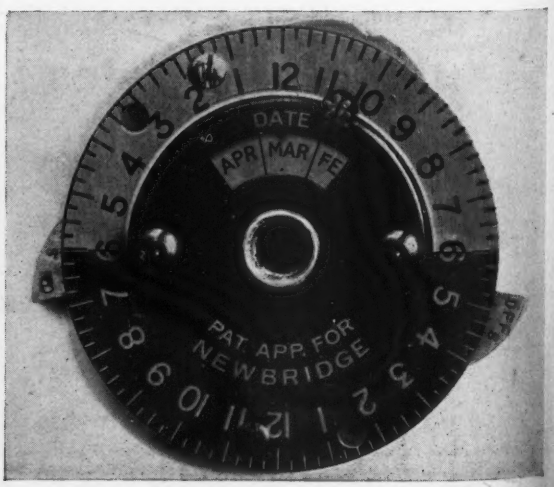


A new form of Low Rate Window Lighting Switch. The complete meter unit with meter and hand switch are mounted on a board at the side of which the actual time switch is shown.

Adelaide House illuminated by long range Kandem floodlighting projectors during the Silver Jubilee Celebrations. On the river frontage the projectors were grouped in two banks, mounted to the crane pedestals, with a total load of 25 kw.

A New Henley Catalogue

A new catalogue issued by W. T. Henley's Telegraph Works Co., Ltd., deals with pressed lead service and branch boxes and cablegrip C.I. Protection Boxes. The boxes are of improved design. It is mentioned that the smaller sizes of claw-type connectors are now being packed in cartons; these, too, are described in the catalogue.



The Newbridge Solar Compensating Dial.

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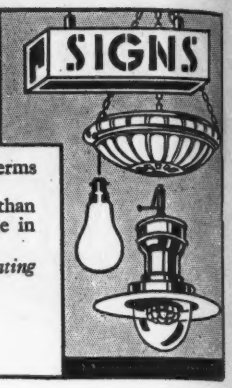

We invite applications for spaces in this new section of the journal. Particulars of terms for each space (approx. 1 inch deep and 3⅛ inches wide) are given below.

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We learn that Mr. Philip Sheridan, who is Joint Managing Director of The Strand Electric & Engineering Co. Ltd., and also a Director of Strand and Interchangeable Signs, Ltd., is sailing on June 15th for America, where he will visit Boston, Toronto and Montreal.

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